EFFECTS OF EXCHANGE RATE VOLATILITY AND INTEREST RATE VARIABILITY ON STOCK RETURNS OF COMMERCIAL BANKS IN NIGERIA

ONAKPA ABEL OBONI

MASTER OF ECONOMICS
UNIVERSITI UTARA MALAYSIA,
JUNE 2019

EFFECTS OF EXCHANGE RATE VOLATILITY AND INTEREST RATE VARIABILITY ON STOCK RETURNS OF COMMERCIAL BANKS IN NIGERIA

By

ONAKPA ABEL OBONI

Thesis Submitted to
The School of Economics, Finance and Banking
Universiti Utara Malaysia,
In Partial Fulfillment of the Requirement for the Master of Economics

Kolej Perniagaan
(College of Business)
Universiti Utara Malaysia

PERAKUAN KERJA TESIS / DISERTASI
(Certification of thesis / dissertation)

Kami, yang bertandatangan, memperakukan bahawa
(We, the undersigned, certify that)

ONAKPA ABEL OBONI (821711)

calon untuk Ijazah
(candidate for the degree of) **MASTER OF ECONOMICS**

telah mengemukakan tesis / disertasi yang bertajuk:
(has presented his/her thesis / dissertation of the following title):

EFFECTS OF EXCHANGE RATE VOLATILITY AND INTEREST RATE VARIABILITY ON STOCK RETURNS OF COMMERCIAL BANKS IN NIGERIA

seperti yang tercatat di muka surat tajuk dan kulit tesis / disertasi.
(as it appears on the title page and front cover of the thesis / dissertation).

Bahawa tesis/disertasi tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan, sebagaimana yang ditunjukkan oleh calon dalam ujian lisan yang diadakan pada:
17 Mac 2019.
(That the said thesis/dissertation is acceptable in form and content and displays a satisfactory knowledge of the field of study as demonstrated by the candidate through an oral examination held on:
***17 March 2019**).*

Pengerusi Viva *(Chairman for Viva)*	:	**Assoc. Prof. Dr. Nor Azam Abdul Razak**	Tandatangan *(Signature)*
Pemeriksa Dalam *(Internal Examiner)*	:	**Assoc. Prof. Dr. Hussin Abdullah**	Tandatangan *(Signature)*
Pemeriksa Dalam *(Internal Examiner)*	:	**Assoc. Prof. Dr. Mukhriz Izraf Azman Aziz**	Tandatangan *(Signature)*

Tarikh: **17 March 2019**
(Date)

Nama Pelajar (Name of Student)	:	**Onakpa Abel Oboni**
Tajuk Tesis / Disertasi *(Title of the Thesis / Dissertation)*	:	**Effects of Exchange Rate Volatility and Interest Rate Variability on Stock Returns of Commercial Banks in Nigeria**
Program Pengajian *(Programme of Study)*	:	**Master of Economics**
Nama Penyelia/Penyelia-penyelia *(Name of Supervisor/Supervisors)*	:	**Prof. Dr. Sallahuddin Hassan**

Tandatangan

PERMISSION TO USE

In presenting this dissertation in partial fulfillment of the requirement for a post graduate degree from the University Utara Malaysia (UUM), I agree that the library of this university may make it freely available for inspection. I further agree that permission for copying this dissertation in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor or in his absence, the Dean of the School of Economics, Finance and Banking, where I did my dissertation. It is understood that any copying or publication or use of the dissertation or parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the UUM in any scholarly use which may be made of any material in my dissertation.

Requests for permission to copy or make other use of materials in this dissertation, in whole or in part, should be addressed to:

Dean of School of Economics, Finance and Banking
University Utara Malaysia
06010 UUM Sintok
Kedah DarulAman

ABSTRACT

Following the adoption of the Structural Adjustment Programme (SAP) in 1986, stock returns of Nigerian commercial banks have been largely influenced by macroeconomic variables of which, exchange rate volatility and interest rate variability are dominant. The effect of changes in these variables has resulted in substantial loss of value in portfolio investment. The aim of this study is to analyse descriptively the performance of stock returns of Nigerian commercial banks from 2010 to 2017; to determine the relationship among exchange rate volatility in 2016 and its conditional volatility in periods beyond; and to evaluate the effects of exchange rate volatility and interest rate variability on the performance of stock returns of Nigerian commercial banks. Exponential Generalised Autoregressive Conditional Heteroscedasticity (EGARCH) and Autoregressive Distributed Lag (ARDL) models were used to analyse secondary data spanning the period 2010 to 2017. Results obtained indicate that the performance of stock returns of most commercial banks are dictated by the direction of movement of exchange rate and interest rate; exchange rate volatility in 2016 is related to the conditional volatility in the period beyond; and that the performance of stock returns of Nigerian commercial banks is significantly determined by exchange rate volatility and interest rate variability. The study recommends that alternative non-oil bilateral trade relations should be exploited to increase foreign exchange earnings of government to meet the ever increasing demand which exerts pressure on the exchange rate. It further recommends that government implement policies such as inflation targeting to act as a hedge to exchange rate volatility and interest rate variability. Government should also maintain its foreign reserve at a level where the foreign exchange market is sustainable at all times.

Keywords: stock returns, exchange rate volatility, interest rate variability, Nigeria

ABSTRAK

Susulan daripada perlaksanaan Program Penyesuaian Struktur (SAP) pada tahun 1986, pulangan saham bank komersial di Nigeria telah dipengaruhi oleh pemboleh ubah-pemboleh ubah makroekonomi iaitu volatiliti kadar pertukaran mata wang asing dan kebolehubahan kadar faedah. Perubahan pembolehubah-pemboleh ubah ini telah mengakibatkan kerugian yang amat ketara nilai pelaburan portfolio. Tujuan kajian ini ialah menganalisis secara deskriptif prestasi pulangan saham bank-bank perdagangan Nigeria dari tahun 2010 sehingga 2017; menentukan hubungan antara volatiliti kadar pertukaran pada tahun 2016 dan volatiliti bersyaratnya pada jangka masa akan datang; dan menilai kesan volatiliti kadar pertukaran dan kebolehubahan kadar faedah ke atas pulangan saham bank-bank komersial di Nigeria. Model *Exponential Generalised Autoregressive Conditional Heteroscedasticity* (EGARCH) dan Lat Tertabur Autoregresif (ARDL) digunakan untuk menganalisis data sekunder bagi tempoh 2010 hingga 2017. Dapatan kajian menunjukkan bahawa prestasi pulangan saham bagi kebanyakan bank-bank perdagangan ditentukan oleh arah pergerakan kadar pertukaran dan kadar faedah; volatiliti kadar pertukaran pada tahun 2016 adalah berkaitan dengan volatiliti bersyaratnya dalam jangka masa akan datang; dan prestasi pulangan saham bagi bank-bank perdagangan Nigeria secara signifikan ditentukan oleh volatiliti kadar pertukaran mata wang asing dan kebolehubahan kadar faedah. Kajian ini mengesyorkan bahawa alternatif hubungan perdagangan dua hala bukan minyak perlu dieksploitasi untuk meningkatkan pulangan pertukaran asing kepada kerajaan bagi memenuhi peningkatan permintaan yang memberi tekanan kepadakadar pertukaran. Cadangan selanjutnya ialah kerajaan melaksanakan polisi seperti inflasi bersasar yang bertindak sebagai pelindung kepada volatiliti kadar pertukaran dan kebolehubahan kadar bunga. Pihak kerajaan juga perlu mengekalkan rizab antarabangsa pada tahap yang mampan pada setiap masa.

Kata kunci: pulangan saham, volatiliti kadar pertukaran, kebolehubahan kadar faedah, Nigeria

ACKNOWLEDGEMENT

All thanks and praise is to God Almighty the One who gives and sustains life. I am grateful to Him for making me both to be born and be born again without which no ambition can be conceived or accomplished. I am glad to say that His grace and mercy which began this academic journey with me was sufficient while the journey lasted. The depth of my gratitude can best be captured by the wordings of the Christian hymnal by Charles Wesley (1739):

Oh for a thousand tongues to sing,
My great Redeemer's praise,
The glories of my God and King,
The triumphs of His grace!

I wish to appreciate the painstaking efforts of my kind supervisor Professor Dr Sallahuddin Hassan for his time and input without which this work would not have been completed on time. I deeply appreciate his dedication to reading through the entire work and making critical comments in every deserving area. To all my lecturers who took the taught courses, I say thank you for your time and efforts.

I also wish to acknowledge Professor Ahmadu Umaru Sanda for facilitating the process leading my admission. Your encouragement during my stay in University Utara Malaysia as a student is also appreciated. I am also grateful to Mr. Sam Saba for taking interest in my request and seeing to the approval of my study leave while in office as Chairman of the Code of Conduct Bureau.

I must not fail to mention how deeply grateful I am to my father Supol. Michael Onakpa (Rtd) whose comments reignited my interest to seek again an opportunity for a postgraduate study after several failed attempts. As it was in several other occasions in time past, your fatherly comments were not just handy but timely. Together with mummy Edna Aladi Onakpa you have given very many other supports while this journey lasted for which I am thankful. I am grateful to you too Dr Onakpa Michael Monday for your sacrificial giving and sundry supports.

My special gratitude goes to my amiable wife Grace Neku Onakpa for holding forte at the home front while I took leave in pursuit of this all important and once-in-a-life-time ambition. I understand the enormity of the challenges you faced and really appreciate your patience. Thank you too my wonderful kids Isaac, Rachael, and Israel for your patience during the long period you awaited daddy's return.

Finally, I am thankful to the very many other individuals including siblings, friends, colleagues, neighbours, and well-wishers for their show of love through calls, SMS, and prayers. May God reward your labour of love.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

STR	Stock Returns
ERV	Exchange Rate Volatility
IRV	Interest Rate Variability
MYS	Money Supply
INR	Inflation Rate
CPI	Consumer Price Index
AR	Autoregreesion
ACF	Autocorrelation Function
NSE	Nigerian Stock Exchange
CBN	Central Bank of Nigeria
ARCH	Autoregressive Conditional Heteroscedasticity
GARCH	Generalised Autoregressive Conditional Heteroscedasticity
EGARCH	Exponential Generalised Autoregressive Conditional Heteroscedasticity
VECM	Vector Error Correction Model
GARCH-M	Generalised Autoregressive Conditional Heteroscedasticity in Mean
EMU	European Monetary Union
ARDL	Autoregressive Distributed Lag
CAPM	Capital Asset Pricing Model
APT	Arbitrage Pricing Model
ARMA	Autoregressive Moving Average
FGN	Federal Government of Nigeria
IMF	International Monetary Fund

SAP	Structural Adjustment Programme
FDI	Foreign Direct Investment
TSA	Treasury Single Account
CRR	Cash Reserve Ratio
MPR	Monetary Policy Rate
GDP	Gross Domestic Product
FEM	Foreign Exchange Market
IFEM	Inter-bank Foreign Exchange Market
SFEM	Second-tier Foreign Exchange Market
ECT	Error Correction Term
ECM	Error Correction Mechanism
VAR	Vector Autoregression
DF	Dickey-Fuller
ADF	Augmented Dickey-Fuller
ARIMA	Autoregressive Integrated Moving Average
LM	Lagrange Multiplier
OMO	Open Market Operation

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter introduces the entire study. Section 1.2 lays the background of the study with emphasis on the historical development of commercial banking in Nigeria. Section 1.3 presents detail of the problem that the study seeks to address. While Section 1.4 poses the research questions, Section 1.5 answers the questions in the form of research objectives, which are stated both in general and specific forms. The significance and the scope of the study is the focus of Section 1.6 and Section 1.7 respectively. In conclusion, Section 1.8 gives a synopsis of how the study is organised.

1.2 Background of the Study

Commercial banks are known to play significant role in any economy. They constitute a large part of the financial system helping to source funds from the surplus unit to the deficit unit of an economy for the purpose of economic development. Their roles include customers' deposit acceptance, provision of business loans, and the offering of basic investment products. Their ability to perform these roles however depends on a number of factors of which liquidity and capital base are paramount. To help attain optimum liquidity and a strong capital base that is required for efficient performance, the Nigeria banking system had been subjected to a number of reform measures aimed at systemic and structural transformations over the past years. While it may be difficult to say that each of the past

reforms did achieve all that it sets out to achieve, collectively however, the reforms have helped the banks to stay afloat and carry out their functions.

The commencement of formal banking operations in Nigeria dates back to 1892 following the establishment of the African Banking Corporation in Lagos (Beck, Cull, & Jerome, 2005; Oluduro, 2015). Other banks which came into operation thereafter included the colonial bank and the British and French bank. These three banks, whose operations began in the pre-colonial period, have survived through tick and tin and are still operating in Nigeria until now. They currently go by the name First Bank of Nigeria (FBN), Union Bank of Nigeria (UBN), and United Bank for Africa (UBA), respectively. They rank as Nigeria's first generation banks and were established in the days when banking practices were largely unregulated. Oluduro (2015) submits that it was only after the amalgamation of 1914 that indigenous banks were allowed to be established. Between 1914 and 1952, many banks were established but only two of these banks survived the challenges of the time. These two were National Bank of Nigeria and the African Continental Bank Limited.

The Paton's Commission of enquiry constituted to investigate the cause of the high mortality rate in the banking system at the time came up with far reaching recommendations in its report submitted in 1948. One of the outcomes of the recommendation of that report was the promulgation of the 1952 banking ordinance. It was closely followed by the Central Bank of Nigeria (CBN) Act of 1958, which, in addition to giving legal coverage to the establishment of the CBN, also empowered it to promote and integrate the Nigerian financial system (Soyibo & Adekanye, 1992). The 1952 banking ordinance marked the beginning of banking regulation in Nigeria and encouraged the

establishment of many banks including specialized ones like Development Banks and Merchant Banks. It is worth noting that from this point onwards the development of banking has been anchored on reforms embarked upon by different governments at different period.

The fallout of the 1952 banking ordinance as well as the 1958 CBN Act was the establishment of several banks including Banque Internationale Pour L'Afrique Occidental (BIAO) which was afterwards renamed Afribank. Many commercial banks were also established in the 1970s in joint venture arrangements between foreign investors and the Federal Government of Nigeria (FGN) in which the FGN took the controlling share. The Indigenisation decree of 1977 limited foreign participation in banking to 40 percent of equity shares only. It was a period characterized by large government participation in banking. This period lasted up until the mid 1980s. The aim of the public sector dominance of the banking industry at that time was to ensure the allocation of resources to critical sectors of the economy, an act which was made possible by the distortion of financial prices in a deliberate and calculated manner by monetary authorities. Financial prices such as interest and exchange rates were largely controlled to suit the interest of government. And because financial resources were distributed through credit rationing, economic development through productive investment was hampered. As a result, the national currency suffered substantial loss of value, and external debt service became a huge challenge. The need for financial liberalization became urgent and Structural Adjustment Programme (SAP), an initiative of the International Monetary Fund (IMF) became the proposed vehicle to effect necessary structural changes in order to drive the economy efficiently.

By June 1986, SAP was introduced by the FGN and it heralded some of the major changes that re-ordered the business of banking in Nigeria. For example, it was through the financial liberalization reform, an aspect of SAP that exchange rate, for the first time, was deregulated. The Second-tier Foreign Exchange Market (SFEM), an auction-based platform for foreign exchange transactions, brought an end to the previously controlled operation in that market. The SFEM operated side-by-side the first tier foreign exchange market (FEM) for a while before the Inter-bank Foreign Exchange Market (IFEM) was introduced, an avenue through which the banking sector was legally permitted to actively participate in foreign exchange transactions. That development however resulted in the proliferation of new banks, having been motivated by attractive arbitrage opportunities that became rampant in the market.

The arbitrage activities of banks in the currency market at that time, as well as other unethical practices worsened the financial position of many banks and non-banks financial institutions leading to loss of public confidence in many of them. To restore the lost confidence, measures taken by the authorities led to the classification of many precarious banks as distress, for which the operational licenses of several of them were revoked. Since then, either directly or indirectly, exchange rate matter has remained pivotal in shaping banking operations in Nigeria. This accounts for why the business of banking has remained pivotal to economic policy makers.

The apparent effect of exchange rate devaluation during the SAP era was the fall in exchange rate that was witnessed thereafter. As Anyanwu (1992) noted, up from ₦1.5691/USD1 in September 1986, the exchange rate went down to ₦7.8950/USD1 by

mid-February 1990. With an adverse balance of payment position that ensued, the falling rate has continued ever since, occasionally worsened by a major shock to the highly sensitive economy reacting to the interactions of economic forces in the world market. Though variants of the exchange rate regime (e.g. dual exchange rate regime of 1996) were introduced at different times, little could be achieved in terms of curbing the volatility level it has assumed. The financial meltdown of 2008 as well as the 2016 fall in global oil price both contributed to further worsen the exchange rate position. Figure 1.1 depicts the impact of the 2008 and 2016 shocks on the Naira/USD exchange rate.

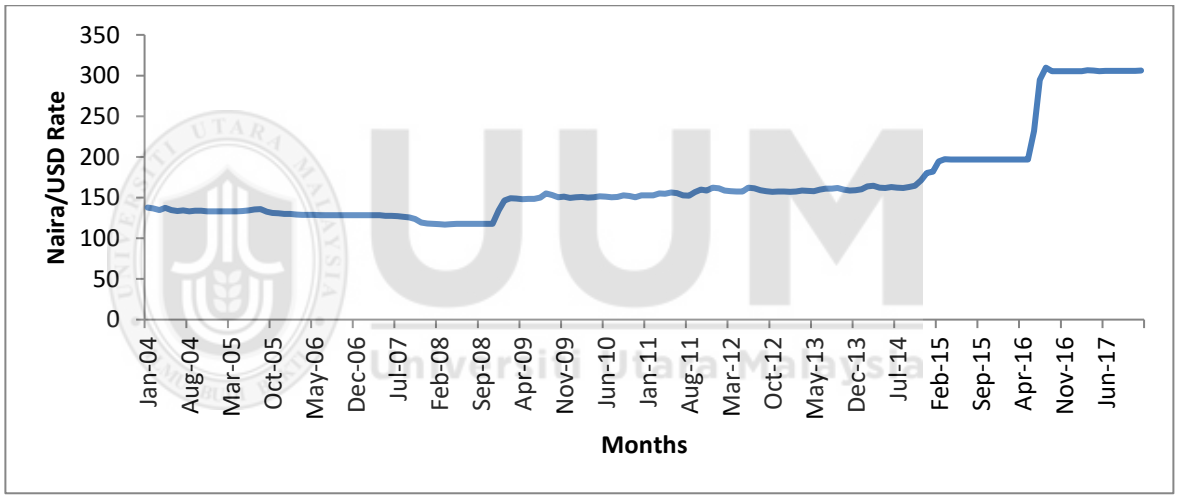

Figure 1.1
Trend of Naira/USD Exchange Rate, 2004-2017

The financial sector liberalisation reform of the SAP era also brought with it interest rate deregulation which was aimed at inflation moderation, mitigation of pressure arising from adverse balance of payment position, stable exchange rates, savings and investment stimulation as well as promotion of macroeconomic cum financial sector stability. However, the inability of the entrenched measures to realise the set objectives resulted in the disparity that has been witnessed between deposit and lending rates, and lately between

prime lending rate and maximum lending rate. The intervention of the monetary authorities to limit the disparity could not help much. Interest rates such as the Treasury bill rate became market driven and subjected to regular variation. That was the period when indirect control measures through the adoption of monetary policy instruments such as reserve requirements, moral suasion, as well as the popular open market operations (OMO) were introduced in the management of monetary and financial matters in the country (Ayadi, Adegbite, & Ayadi, 2008). Little wonder then that the volatility in exchange rate occasioned by the 2016 devaluation was reflected in the interest rates as depicted by the trend in Inter-bank call rate in Figure 1.2.

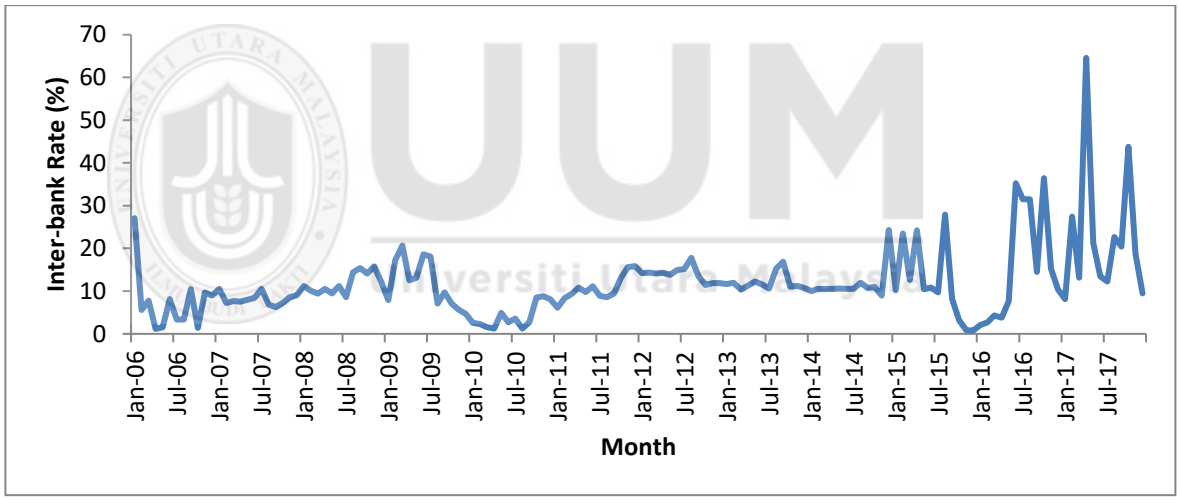

Figure 1.2
Trend in Monthly Inter-bank Rate, 2006 - 2017

With deregulation, interest rates in Nigeria since 1987 have been susceptible to economic forces. For example, the increased liquidity that attended to the recapitalisation reform of 2004, led to a fall in interest rates. The inflow of foreign direct investment (FDI) as well as the increased access to credit lines provided by foreign banks to local banks which improved the liquidity situation of the local banks was also contributory to the falling

interest rates. It can also be observed that the fall in interest rate as was seen in 2009 resulted from the financial meltdown of the year before. Similarly, the 2016 fall resulted from the devaluation of the Naira (₦) following an initial battle by the authorities to maintain the rate at a particular desirable level. As the authorities eventually gave in to devaluation, interest rates took an upward turn.

Though the 2004 consolidation programme undertaken by the CBN was to ensure stronger commercial banks capable of playing the role of intermediation and competing favourably in the global market place, the improved liquidity that comes with it, forcing down interest rates, may have become challenging to the banks. However, with a strong capital base successfully achieved, the impact of the interest rate fall was not immediately felt. Moreover, given that each bank that survived the recapitalisation reform acquired the status of public liability company (PLC) unlike what was obtained prior to that time, prices of stocks of the banks in question experienced rising trends owing to increased marketability of their stocks. Among other factors, it has been argued that interest rate deregulation as well as recapitalisation of the banking sector impacted positively on the Nigerian stock market (Adenuga, 2010). For example, by the end of that exercise, the aggregate Nigerian banking system capitalisation rose from ₦311 billion to ₦932 billion. Other benefits of the exercise included improvement in shareholders' funds and asset base as well as branch network in the years following. Encouraged by the outcome, the banks were further encouraged to embark on another round of recapitalisation, this time, driven by an incentive offered by the CBN to manage foreign assets.

But liquidity constrains within a short while into the post consolidation period led to the collapse of some more banks whose corporate identity got lost through merger and acquisition (M & A) leaving a total of 22 commercial banks currently operating in the country. However, the asset base of many of the banks improved drastically after the recapitalisation reform with many of them, aided by M & A also gained wider spread in their branch network. Quite a number of these banks including Access Bank and Eco Bank went international, with a handful of branches established in other nations of the world.

But the euphoria that attended to many investors in bank stocks in the wake of the 2004 recapitalisation drive in the banking sub-sector was short-lived. The 2008 Global Financial Meltdown and its attendant adverse effect, made away with whatever values many investors in bank stocks had left. Many of these investors, particularly those who were new to stock investment hurriedly sold off their stocks with a view to redeeming whatever was left of them. It was an experience which for many of the affected investors marked the beginning of the loss of confidence in stock investment, a situation that may have slowed down performances of stocks in the capital market.

More recently, following the fall in global oil price beginning in June 2014 (due to decreased demand) and in the revenue that accrued there from, Nigeria's foreign reserve dropped by 17.31 percent i.e. from USD34.20 billion to USD28.28 billion by end-December 2015. The combine effect of falling reserves in the face of sustained demand for foreign exchange, arising from the lopsided predilection for imported goods as well as the unwholesome speculation in the domestic currency market, much pressure was exerted on the exchange rates. Though CBN's commitment to safeguarding the falling ₦ value was tested, its resolve to commit to its statutory responsibility was total. But considering the

level of depletion in the foreign reserve within a short period of time, it gave up efforts. This led to the subsequent decision to suspend further commitment to safeguarding the ₦ value hence making way for the devaluation of the currency and the result was a catastrophic fall, such that was never seen in the history of exchange rate in Nigeria. The devaluation effect is graphically captured in Figure 1.1.

The financial crisis that followed in 2016 was deep and wide spread. The atmosphere over the economy became gloomy with high inflation and unemployment rates, annual GDP contracted to negative 1.5 percent growth rate in 2016 from 2.79 in 2015, as domestic debt profile continue to rise. The GDP growth rate in the non-oil sector witnessed a decline to the tune of 0.22 percent in real terms. Reduced activities in financial services, trade, real estate and construction, were identified as responsible for the decline. Specifically, the financial institutions real output decline of 5.57 percent led to the financial sector contraction by 4.56 percent in real terms. The effect of this contraction was reflected in the falling prices of bank stocks as shown in Figure 1.3.

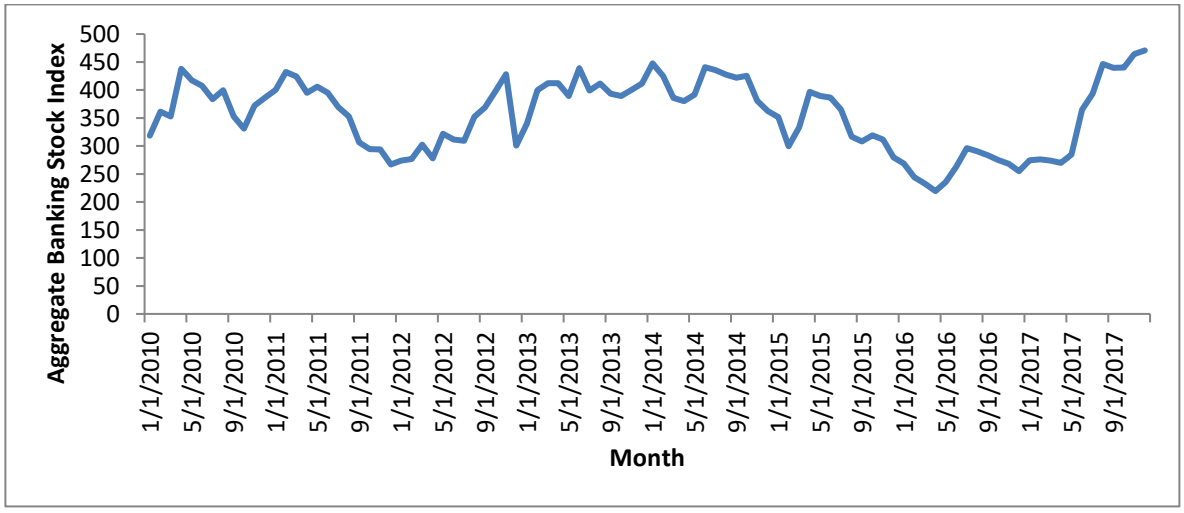

Figure 1.3
Nigerian Stock Exchange Bank Index, 2010 – 2017

Though the CBN annual reports as well as its half year activity reports containing these data were made on sector-by-sector basis, and the financial sector was adjudged as thriving, yet much remained unknown as regards how the commercial banks fared. The contractionary monetary policy of the CBN however was suggestive of challenging times for the commercial banks on whose shoulders lay the responsibility to drive them. For example, the upward adjustment of the monetary policy rate (MPR) from 11 percent to 12 percent in March 2016 and further to 14 percent in July of the same year was worrisome. Additionally, the cash reserve requirement (CRR) was raised by 250 basis point to 22.50 percent. Perhaps, beyond the contractionary monetary policy, the reduction in the banking system liquidity was triggered more by the holistic implementation of the Treasury Single Account (TSA), a policy that merged all state owned accounts with commercial banks into one account domiciled at CBN. And with the suspension of nine commercial banks owing to their inability to remit proceeds of the sale of foreign exchange, the intensity of the liquidity challenge became more pronounced and ominous.

The concern raised by these developments have necessitated a number of questions such as "how did the commercial banks performed financially during that period?" More specifically, "what effects does the volatility of exchange rate as well as the variation in interest rates have on stock returns of commercial banks?" The need to answer questions such as this using scientific method of investigation necessitates this research considering the fact that transaction in the foreign exchange market in Nigeria (since SAP) is dominated by the commercial banks. More so, because monetary measures implemented by the monetary authorities during periods of financial crisis are routed through the commercial banks, a study to determine the implication of such policy measures on stock returns of

these banks will be in order. Further, since monetary policy majorly revolves around interest rates, and interest rates themselves are considered the fabric on which banking operations are woven, including such a variable that can affect stock returns is justified particularly at a period of its high variability.

However, relying on figures on domestic credit made by the commercial banks between 2015 and 2017 as shown in Table 1.1, it can safely be inferred that the banks were cruising on a safe pedestal. But that the economy in which they operate did slip into recession in 2016 and with many of the economic indicators such as exchange and interest rates remaining highly volatile is indeed worrisome and suggestive of an impending financial crisis in the horizon. Early diagnostic checks on the apparently undesirable level of these all important economic indicators can save the future of commercial banking in Nigeria.

Table 1.1
Net Domestic Credit (₦), 2015 - 2017

	Total Net Domestic Credit *(₦)*		
	2015	2016	2017
January	20,141,571.01	22,358,143.32	26,508,030.42
February	20,647,704.82	22,568,685.71	27,209,343.43
March	20,757,618.39	22,664,815.74	27,675,371.94
April	20,695,566.30	23,312,346.17	27,514,336.86
May	21,210,501.61	22,852,137.01	26,836,772.47
June	21,409,774.20	24,623,626.70	27,236,433.60
July	21,542,547.27	25,424,599.11	28,033,384.60
August	21,393,011.53	26,356,276.28	26,821,446.81
September	21,519,790.11	26,254,660.96	26,985,305.21
October	21,348,605.01	26,700,723.50	27,174,805.81
November	20,470,803.46	26,695,865.72	26,349,068.54
December	21,612,452.09	26,857,719.34	25,863,280.61

Source: CBN, 2015 - 2017

1.3 Statement of the Problem

A number of macroeconomic variables have been advanced as having significant influence on stock returns of public quoted banks on the capital market across countries. While many studies conducted in this area have focused on the performance of the entire stocks of all quoted companies, few studies have focused attention on a sector by sector or on individual company basis, and fewer more on individual bank basis. Evidence obtained has shown that the levels of significance as well as the direction of flow of causal effect among variables of most studies vary from country to country or even from study to study. However, what has remained unclear largely because little or no evidence abound is the level of influence of the macroeconomic variables on the individual banks. Generalised results may not be sufficient evidence than can explain the state of individual banks on the stock market in the face of frequent liquidation of many of them. The need for a study that x-rays the stock performance of each bank with a view to assessing their financial soundness cannot be overemphasized. Knowing the extent or magnitude of influence exerted on each bank's stock returns by any of the prominent macro variables will provide various stakeholders with necessary information for better decision. Of equal importance is the need to draw parallel in returns between the banking sector, industrial sector, and the ASI with a view to determining the existence of shared influence of the macro variables on each of their returns.

The volatility of exchange rates in Nigeria between 2014 and 2016 have largely been occasioned by changes in economic dynamics such as the fall in the international price of oil leading to the shortfall in the revenue which accrues there from. Volatility of the rates in periods beyond may be necessitated by other factors some other than those responsible for

the volatility now. However, the straight jacketed solution often adopted by the CBN has proven to be both ineffective and unscientific in addressing the situation adequately. The need to establish whether a linkage exist between volatility now and of the future is therefore imperative.

By the last quarter of 2015, most of Nigeria's economic growth indicators were showing declining trend. The situation worsened however in the third quarter of 2016 leading to the eventual slip of the economy into recession. It was the lowest point of economic performance in over two decades. Exchange rates were at their lowest points as the ₦ depreciated well over 100 percent to the dollar within a space of 12 months in the foreign exchange market. There was suspicion that the prevalence of falling prices of stocks at the capital market particularly those of commercial banks at the time resulted directly from the falling exchange rates. Similarly, the CBN's effort to shore up the economy by jiggling the interest rates often times have yielded favourable result in boosting domestic credit notwithstanding the prevalence of the incidence of nonperforming loans as well as credit default that was on the increase. It was particularly observed that positive returns have attended to bank stock when such measure was taken by the CBN. Whether a fall in exchange rate or an adjustment in interest rates are responsible for the fall or rise in stock returns of Nigerian commercial banks over time led to the interest to investigating whether a relationship exist between the three variables.

1.4 Research Questions

Arising from the problems posed in Section 1.3, this study will attempt to answer the following research questions.

i. How do stock returns of Nigerian commercial banks performed between 2010 and 2017 and in comparison with the industrial sector stock returns and the ASI?
ii. What is the relationship between exchange rate volatility of 2016 and its conditional volatility in periods beyond?
iii. How do exchange rate volatility and interest rates variation affect stock returns of Nigerian commercial banks?

1.5 Objectives of the Study

The general objective of this study is to investigate the effect of exchange rate volatility and interest rates variability on stock returns of Nigerian commercial banks. This shall be achieved through the following specific objectives:

i. to analyse descriptively performance of stock returns of Nigerian commercial banks between 2010 and 2017 and compare same with industrial sector stock returns as well as the ASI.
ii. to determine the relationship between exchange rate volatility in 2016 and its conditional volatility in periods beyond; and
iii. to evaluate the effect of exchange rate volatility and the interest rate variation on stock returns of Nigerian commercial banks.

1.6 Significance of the Study

Often time the early identification of symptoms that can result into full blown crisis remains a challenge to policy makers. This underscores the need for a study on the interactions among economic variables across different divides with a view to understand what the likely outcomes of such interactions are. The need becomes even more crucial particularly when a variable that should ordinary be fairly stable becomes highly volatile. Therefore a study of this nature on an economy when its important indicators show ominous signs of crises cannot be overemphasized as early detection of what may become a problem will assist policy makers advance policy measures that will forestall economic loss.

Secondly, the knowledge of exchange rate volatility and interest rates variability and how they affect banking stock performance will enable policy makers put in place policy measures to forestall the likelihood of any negative impact that may result there from. In particular is the need to prevent the pass-through effect that is likely to be transmitted through the exchange rate via the banking system to the local economy during periods of regional or global economic downturn.

Furthermore, the study is also expected to add to the body of literature which will enhance scholarship and enrich the knowledge base of researchers on the subject matter. In this respect, researchers, policy makers, monetary authorities and financial regulators, stock brokers, portfolio investors, bank executives, financial advisors, students of financial economics, and members of the public will be the beneficiaries.

1.7 Scope of the Study

This study focuses on the effect of exchange rate volatility on the one hand and interest rates variability on the other on stock returns of Nigerian commercial banks. To do so, the banking sector aggregate stock was employed. And because all the 22 commercial banks in Nigeria are publicly quoted, all banks shall form both the sample and population of the study.

The study used secondary data on exchange rate, interest rate, broad money supply, and inflation rate, extracted from CBN annual reports and its other publications. Stock returns of the commercial banks were sourced from DataStream Thomson Reuters. ARCH/GARCH model was used to measure volatility while the multivariate time series econometric technique of Autoregressive Distributed Lag (ARDL) was employed to estimate the dynamic relationship among the variables. Exchange rate and interest rates are the independent variables with stock returns as the dependent variable.

1.8 Organization of the Study

The organisation of this study is in five chapters. Chapter One provides the general introduction including a brief background to the study, problem statement, research questions and objectives, significance of the study, scope as well as the limitations of the study. Chapter Two focuses on review of literature relating to this study with a view to providing the theoretical foundation upon which this study is built. Focus was particularly on exchange rate, interest rates, and stock returns as it relates to commercial banks. Theoretical review of the concepts of stock returns, exchange rate volatility and interest rate variability, and the underpinning theories relating the variables was examined. Empirical

review dealing with the concerned variables was also carried out. Chapter Three, which is about methodology presents the theoretical framework, proposed modeling, explanation on the method of analysis, and the empirical data used for the study. Chapter Four focuses on results and discussion of findings. Chapter Five concludes the study and gives useful recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on review of literature related to the study. It begins with sections on theoretical review of concepts of stock returns, exchange rate volatility as well as interest rate variability. It concludes with empirical literature on exchange rate and interest rate each, as it relates to stock returns.

2.2 Theoretical Review

2.2.1 The Concept of Stock Returns

Stock return simply explains a change in the value a stock expressed in percentage terms. It consists of capital gain which is the difference attributable to changes in stock price between two time periods divided by its purchase price as well as dividend which is an income that accrue to a stock investor at the end of a particular time period (Okech & Mugambi, 2016).

Amihud and Mendelson (1987) identified stock return as partial adjustment between intrinsic value of a stock and its observed price (an adjustment captured by noise sequence). According to the authors, returns are generated when the observed price is pushed away from its value by white noise sequence. They noted that the white noise often results from trading in which case it appears as a short-lived liquidity needs of investors and traders as well as by the mistake made in proper assessment and interpretation of information. Additionally, the white noise is reflective of the trading process by which prices are determined in the market and in this respect it manifests as the arbitrary arrival of buyers

and sellers orders to the market, the temporary state of dealers' inventory position, the discreteness of stock prices, delayed price discovery, and price difference between what is offered and what the seller wishes to accept.

Using a model they developed, Amihud and Mendelson (1987) argued that a coefficient denoted as *g* is a reflection of the adjustment made to transaction prices as movement is made towards the security's value. When *g* equals zero, it shows complete absence of any form of price reaction to changes in value, $0 < g < 1$ indicates partial adjustment, $g = 1$ is full price adjustment, and $g > 1$ reflect overshooting or over-reaction of traders to new information.

Like any market where buying and selling takes place, the capital market often also referred to as the stock exchange is a market for trading different types of financial securities. Amihud and Mendelson (1991) identified two trading mechanisms in the stock market, one of which market makers through their quoted bid and ask prices engage investors in trading relationship with a view to reaching an agreed price. This is referred to as the continuous dealership market. The second type of trading mechanism allows for the accumulation of orders which is been cleared simultaneously at periodic intervals and at a single equilibrium price. It is through these transaction mechanisms that stock returns behavior comparison is made possible over the same period thereby ensuring that information about the value of the stock equally affects both return series. It has been observed that the common practice particularly during opening transactions in major stock issues is to first execute by a periodic clearing procedure, and thereafter, exchange specialists continue trading in a

dealership controlled market. A proof of the effect of these trading mechanisms is the lack of uniformity in return series as reflected in the variance and autocorrelations.

2.2.2 Exchange Rate Volatility

Exchange rate simply means price. Conversely, price is exchange rate. Price is an expression of how much an economic good is worth in a given currency. For example, if the value of a meal served in a road side restaurant in Nigeria is given as ₦360, the price in this case represents the exchange rate and can be quoted as ₦360/meal. But in the context of international finance, an exchange rate of USD1/₦360 simply means the price of dollars given in naira terms. On the other hand, the price of Naira in terms of a dollar is ₦1/USD0.0028. It is simply the reverse form of the former. There is no normal way to express exchange rate. It can be expressed both ways. The expression that states units of foreign currency in terms of a unit of the home currency is termed an indirect rate, e.g. USD0.0028/₦. A direct rate is the reverse of the indirect rate, e.g. ₦360/USD. By definition therefore, we can say that the exchange rate is the relative price of two country's currencies with one stated in terms of the other. Therefore, the exchange rate of naira in terms of dollar is the number of the units of dollars needed to buy a unit of naira.

Obstfeld and Rogoff (1995) define exchange rate as a currency's foreign value. By way of illustration, assuming the pump price per litre of petrol in Nigeria goes for ₦200, and an equivalent quantity of the same product in Malaysia is sold for RM2.58. Assuming an exchange rate of ₦360/USD and RM3.91/USD, the value of ₦/RM equals ₦92.07. This means that, while it will cost an average consumer ₦1000 to buy five litres of petrol in Nigeria, the same quantity will cost him ₦1,187.70 if he were to be in Malaysia. This

implies that with the sum of ₦1000, only slightly above four litres of petrol can be purchased in Malaysia. Conversely, a Malaysian citizen who pays RM12.90 for five litres of petrol in Malaysia will only pay an equivalent of RM10.86 to buy similar quantity in Nigeria. While a Malaysian gets a consumer surplus of RM2.04 for every five litres of petrol bought in Nigeria, his Nigerian counterpart who buys same product in Malaysia must pay RM2.04 (equivalent of ₦187.82) more if he must buy five litres of petrol in Malaysia.

Quite often, the exchange rate of a particular currency is derived from the underlying economic activity that goes on within an economy. This explains why the price of an item produced in a country such as Germany whose legal tender is the Deutschmark can be easily determined and converted to its Naira equivalent by an interested buyer in Nigeria.

Despite the divergence of opinion as to how each individual captures the definition of an exchange rate, one common point at which each of the definitions converge is that, for an acceptable definition of exchange rate, at least two countries' currencies must be involved, with the relative price of one expressed in terms of the other.

Similarly, volatility has been described variously in literature. Flavin (1983) describes it as variance bounds. For Shiller (1981), it is simply a measure of variance. But Engle (2004) describes volatility simply as the square root of variance. And because volatility estimates are time varying, he identifies dynamic volatility (rather than historical volatility) as the appropriate measure of volatility considering the futuristic nature of risk. Jorion (1995) agreed with the description of volatility as the square root of variance (i.e. standard deviation) however consider implied standard deviation (ISD) as the best measure of

forecasting volatility. In the opinion of Mendoza (1995), volatility is considered as large and recurrent fluctuations in the terms of trade which is brought about by shocks to the actual GDP. The sharp fluctuations noticeable in industrial and developing countries, which he also referred to as business cycles, are consequences of fluctuations in price and other nonoil primary commodities.

Besides, and in agreement with Engle (2004) and Jorion (1995), Brodsky (1984) contends that the standard deviation is an entirely measure of volatility. His argument was premised on the assumption of risk aversion as an observed consideration, and with an observation of non-normality in exchange rate distribution, he contends and countered the notion that standard deviation is an erratic and misleading measure of volatility.

According to Flood and Rose (1999), volatility occurs when money supply or liquidity shock affects the nominal exchange rate. Taylor (2001) aligns himself with this perspective by arguing that volatility is the reaction of economic indicators to the instrument of monetary policy (i.e. interest rate and monetary aggregate). He submits that exchange rate volatility results when exchange rate reacts to the instruments of monetary policy.

A strand of literature has attributed the volatility in exchange rate to the collapse of the Bretton Woods system of fixed exchange rates that took place in the early 1970s (Dominguez,1993; Garber & Svensson, 1995; Obstfeld & Rogoff, 1995; Arize, Osang, & Slottje, 2000; and Baum, Caglayan, & Barkoulas, 2001). Dominguez (1993) particularly attributes the high degree of time-conditional volatility in exchange rates to this development. This position however runs contrary to Friedman's (1953), who, in this

seminal paper argued that a floating exchange rate does not necessarily mean a volatile exchange rate. Where volatility is observed, Friedman submits, it is as a result of instability in the underlying economic structure.

Following Friedman's, the flood gate of research on the issue of exchange rate volatility seems to have revolved around his. Many theoretical as well as empirical research findings have either supported or rejected his position. Broda (2004), in an empirical study confirmed Friedman's position. He discovered that fluctuations in exchange rate is not defined by the exchange rate regime in place, rather, and contrary to what is generally believed, his result showed that significantly large declines in real GDP are common place in countries operating fixed regime just as much as with countries operating flexible regime. This position is supported by Flood and Rose (1999) who argued to the effect that there is hardly a noticeable difference between floating and fixed exchange rate regimes in terms of volatility. For them, irrespective of whatever regime a country adopts, macroeconomic variables have been observed to be equally volatile.

According to Ghosh et al. (1997), stability in exchange rates result either from the absence of shock or policy actions put in place to offset shock. By implication, this suggests therefore that exchange rates volatility will result whenever there is a shock in the economy, and more so, when there is no policy action in place to offset such shock. Since no economy is immune to shocks, the much a country can do is to put in place measures that would ameliorate the adverse effect of shock when it occurs. As Cheung and Wong (2000) observed, while speculation is believed to be a non-fundamental factor leading to an increase in volatility, it is also considered as beneficial as it increases market liquidity and

efficiency. To ameliorate the effect of volatility, the authors reported that more than half their respondents suggested official intervention helps restore equilibrium despite claim that intervention exacerbates volatility.

A noticeable effect of volatility is an increase in exchange rate risk which has led to a substantial reduction in international trade and investment due to the risk-averse tendency of most participants in this sector (Mirchandani, 2012). To restore the lost confidence of investors in the sector, governments have oftentimes responded with a downward adjustment or devaluation of the domestic currency, a situation that is aimed at stabilizing the foreign exchange market.

2.2.3 Interest Rate Variability

Fisher (1930) defines rate of interest as the connection between what is earned in terms of income and what is spent on investable assets. It is considered as an extra payment expressed in percentage that is added on an amount of money today in relation to an amount of money to be in hand at an agreed future date. Fama (1975), in reference to Fisher's definition documents that due to uncertainty that pervades the business environment, a situation which blur foresight, nominal interest rate can be defined as the expected return added to the expected consumer price index value. For Jeanchutima and Tangjitprom (2015), it is seen simultaneously as the cost and return of money in financial market.

According to the traditional models of capital asset pricing (Chen, Roll, & Ross, 1986), interest rate equilibrium determination follows a process of interaction between physical

relationships and individual preferences, leading to a process which is assumed to also determine market risk premium. This results in an adjustment in the price of assets which consequently accounts for the differences in their risks. The implication of their argument is that since interest rate determination and market risk determination follows one and the same process, risk premium can be interchanged for interest rate.

Variability in a sense simply explains the stochastic behavior of a variable to change overtime. Variability is used in this study in one respect to connote a deliberate action of monetary authorities to set value as it deems fit, and in another respect the interplay of market forces to determine what the value should be based on the workings of the economy. While the first definition underscores a kind of control measure which is a direct fall out of policy initiative to help direct the outcome of a process, the second, though conventional, applies to certain categories of interest rates. The former most often comes handy as a monetary policy initiative explored by monetary authorities who determines what should be the nominal interest rate as a consequence of the current price level (Leeper, 1991).

Variability of interest rate in a way can be explained from Fisher's analysis of covariance between interest rate (or rate of interest) and inflation. According to Fisher, the interest rate has the tendency to rise when prices are rising, but the extent of the rise cannot be as high as to compensate for the rise and vice versa (Mundell, 1963).

To prevent excessive rise in variability of interest rate, Tabellini (1987) posits that in line with established tradition, the short-term objectives behind the Federal Reserve's monetary

policy is kept from the public. But most often, rather than achieve the aim for which the objectives are shrouded in secrecy, market players, in a frantic move to conjecture the reason(s), have acted in a manner that leaves the interest rate even more variable. But a study by Watson (1999) document that adjustments in aggregate demand is brought about when there is a shift in long-term interest rate which itself is often a reflection of a variation in the Fed funds rate, the Federal Reserve's prime policy tool.

2.2.4 Stock Returns, Exchange Rate Volatility and Interest Rate Variability

Literature on financial economics is awash with explanations on the interaction between stock returns and factors that determine them. Chen, Roll, and Ross (1986) relate stock returns to systematic risk which according to them arises from the instability that surrounds an investment which is being propelled by market forces. This risk which is sometimes referred to market or undiversifiable risk is inherent and particular to the environment of business operation. Their argument is that alterations in macroeconomic variables such as exchange rate, interest rates, money supply and inflation are the originators of risk that are priced separately in the stock market. Implicit in their theory is the notion that substantial influence to pricing of stock market aggregates is brought about by the general economic state variables. Stock returns most often are indirectly affected by a number of systematic variables operating within the economy whose influence was first on the pricing operator. The systematic risk factors often times also include those variables described as natural occurrences. Though the direct influence of such variable on current cash flows may not be pronounced, the long run effect is that its capacity to cause change to a set of investment opportunities is guaranteed.

In a related development, Bansal, (2007) documents that expected growth in the long-run as well as the unpredictability of future economic prospects are the two mediums through which asset price becomes susceptible to change. His position is predicated on an earlier work alongside Yaron, in which the popular long-run risks asset pricing model (otherwise referred to as general equilibrium model) was propounded (Bansal & Yaron, 2004). The general equilibrium model is a framework widely used to explain the risk-return connection (Bollerslev, Tauchen, & Zhou, 2009; Bansal & Shaliastovich, 2010; and Tauchen, 2011). The framework was pioneered by Leon Walras in his 1874 work entitled Elements of Pure Economics. It is argued that the original model is a two-factor framework of stock market volatility and its relationship with time-varying risk premiums, however, it has also created an endogenously leverage effect that is dependent on risk reversion and intertemporal elasticity of substitution parameters. This framework forms the basis of the knowledge with which empiricists in the financial market believe that short term movements in financial prices result from stochastic time-varying volatility (Tauchen, 2011).

Khatchatrian and Yaron (2005) are among numerous scholars who submit that uncertain economic conditions are predictors of stock values and vice versa and that each of the variables are negatively related to the other. Bollerslev, Tauchen, and Zhou (2009) argue that the divergence in realised and implied returns is explained by the time varying risk premium which makes the task of predicting stock returns either for low or high variation possible since they shall be followed by a low or high returns.

Besides, the proposition of Ross (1976) of the Arbitrage Pricing Theory (APT), an alternative and more general model attempts to explain security expected returns in

arbitrage equilibrium. The Capital Assets Pricing Model (CAPM) provides the basis for the model which encompasses a multi-factor return generating process. This model incorporates at least three significant macroeconomic factors whose explanatory powers results in arbitrage pricing. However, the use of market portfolio by this multifactor model drew substantial criticism particularly the implicit assumption that the market portfolio is ex-post efficient which may not always be the case (Diacogiamnis, Tsiritakis, & Manolas, 2001).

2.3 Empirical Review

2.3.1 Exchange Rate Volatility and Stock Returns

The quest to understand the interdependence between exchange rate and stock returns has elicited great interest over the years particularly among scholars in the field of financial economics, accounting as well as finance. While the historical basis for the linkage may be traced to the flexible exchange rate system that emerged in the early 1970s, the swelling internationalisation of most economies (in which case the banking sector has been an integral part) may also be responsible for the heightened interest in this field (Choi, Elyasiani, & Kopecky, 1992). Many studies have been conducted with a view to determining whether or not there exists any significant connection between the two variables as well as the course of flow which the causal association is likely to take.

Historically, many researchers who have conducted studies on exchange rate vis-à-vis stock returns have sort to determine the inter-relationship between the variables. Kanas (2000) for example, conducted a study to determine whether there exist interconnectivities between stock returns and changes in exchange rate in six advanced countries including Canada,

France, Germany, Japan, the United Kingdom (U.K), and the United States (U.S.). Using Exponential Generalised Autoregressive Conditional Heteroscedasticity (EGARCH) model to test for volatility spillovers, he established that in all six countries except Germany, volatility in exchange rate is an outcome of changes in stock returns. However, he noted that though spillovers from stock returns to exchange rate changes suggest noticeable increment, no evidence exist of the reverse situation for any of the countries. Though his finding supports the general believe of an increasing integration in the international financial markets evidence from Turkey obtained by Türkyılmaz and Balıbey (2014) on the contrary supports a significant and bidirectional transmission of shocks and volatility between stock returns and exchange rate.

Similarly, in a study to determine the linkage between exchange rates and stock prices among eight Asian countries, Granger, Huangb, and Yang (2000) analysed data with models of unit root and cointegration and found that for Japan and Thailand, exchange rate significantly and positively determine stock returns. However, the reverse was the case when data from Taiwan was analysed, an indication that the outcome envisaged by the portfolio approach where stock prices are determined by exchange rates with negative relationship may not hold true in all cases. They noted the failure of result from Singapore to reveal any recognizable pattern, unlike those from Indonesia, Korea, Malaysia, and the Philippines which indicated strong feedback relations. The study has its background in the Asian Financial Crisis of 1997. The mixed results in this particular study is supported by the results of the study conducted by Jawaid and Ul Haq (2012) on Pakistani banking industry where he found significant negative long run relationship between stock prices and

exchange rate but positive and significant relationship between stock prices and volatilities of exchange rate.

Furthermore, in a study conducted by Ooi et al. (2009) with a view to determining the impact of the 1997/98 Financial Crisis in Asia on exchange rates-stock prices relationship particularly to investigate what the relationship was during the period before the crisis and what it became after the crisis. Their daily data spanning 1993 to 2003 for both Thailand and Malaysia showed that there exists for Thailand a causal relationship whereby exchange rates are led by stock prices in both the periods before and after the crisis. Similar result was obtained for Malaysia but limited to the post-crisis period only. The scholars arrived at these results using multiple methodologies including cointegration and variance decomposition analysis.

Moreover, Hahm (2004) in an empirical investigation of Korean banking institutions to exchange rate exposure reported that commercial and merchant banks in Korea are significantly vulnerable to risks arising from exchange rate. The author particularly noted that the pre-crisis exposure greatly determined the profitability of commercial banks significantly. Additional evidence suggests that the simultaneous occurrence of the acute loss of value of the Korean won and the susceptibility of the institutions of banking at the time worsened the currency and financial crisis of the late 90s.

Besides, even in the less liberalized Chinese economy, some similarity with previous research results is noted in the investigative study of Meng and Deng (2015) to determine

how stock returns of banks has been affected by changes in exchange rates. The study which employed the Generalised Autoregressive Conditional Heteroscedasticity(GARCH) model to analyse data for 14 listed Chinese banks, found that regardless of each bank's reaction to portfolio risks, gesticulations in the market place, and changes in exchange rate, the exchange rate variable has remained statistically relevant in explaining stock returns of banks. By the same token, Elyasiani and Mansur (2003) in their investigation of the macroeconomic determinants of bank stock for U.S. and Japan on one hand, and U.S. and Germany on the other, found the impact exerted by exchange rate on stock returns to be more at the volatility level.

Specifically, Ratanapakorn and Sharma (2007) documented that exchange rates and stock prices are positively related. Their position emanates from the outcome of an investigative study of the relationship between some macroeconomic variables and the U.S. (S&P 500) stock price index spanning the period 1975Q1 to 1999Q4. Their findings further revealed that in the long-run as opposed to the short-run, the exchange rate variable Granger caused stock prices. Moreover, an indication that the exogeneity of stock prices relative to the exchange rate and other variables is provided by variance decomposition (VDC) to the tune of about 87 percent as a proof that its own variance even after 24 months is explained by its own stock.

Also, at the industry level, Hyde's (2007) investigative study to determine the responsiveness of stock returns to market, interest rate, and exchange rate shocks in the economies of four major European countries of Italy, France, Germany, and the U.K.,

found that stock returns of all four countries is significantly susceptible to risk from exchange rate. This result is in agreement with the result obtained by Ratanapakorn and Sharma (2007). But the empirical evidence of Yang and Doong (2004) which suggest a less direct impact of exchange rate on stock future prices seemed like a deviation from a list of results indicating positive significance. However, Yang and Doong's study which focused on the G-7 countries was particularly noted for its importance as diversification strategies and hedging devise useful for managers of international portfolio investments.

But unlike Yang and Doong (2004), Antwi, Ebenezer, and Zhao (2012) found a cointegrating association between the All-share index of the Ghana Stock Exchange (GSE) and exchange rate. In a study to investigate the influence of some factors on prices of equity stocks in Ghana, the authors sort to validate the relationship between stock prices and the exchange rate variable and through it predict the probable changes in stock prices given changes in exchange rate. Monthly data of GSE All-share index and that of the exchange rate variable for the period January 2001 to December 2011 was used along with the application of cointegration methodology. It was established that the influence of exchange rate volatility on GSE were nearly imaginary.

Nevertheless, for Muhammad, Rasheed, and Husain (2002), diversities were found in both the short-run and long-run correlations between exchange rates and stock prices for four South Asian countries including Pakistan, Sri Lanka, India, and Bangladesh. Their bivariate cointegration tests using monthly data from January 1994 to December 2000 gave evidence that suggest no short-run and long-run relationship between stock prices and exchange rates for Pakistan and India. While results for Bangladesh and Sri Lanka also indicated a no

short-run relationship, causality relationship between the variables and for both countries was long-run bi-directional. What this suggests is that in South Asian countries exchange rates and stock prices are unrelated (at least in the short run); a wakeup call for investors not to predict the behavior of another market using information obtained from any of the markets. Similar to Muhammad, Rasheed, and Husain, is the results obtained for Turkey by Aydemir and Demirhan (2009) which showed that the causal relationship between all stock market indices and exchange rate is bidirectional.

Additional evidence from among the emerging markets where stock returns have been accorded the description of a higher volatility status when compared with their counterparts in the more developed markets, Abugri (2008), in an investigative study using Vector Autoregressive (VAR) model to establish how the transmutation in various influencing factors like exchange rates interfaced with returns from stock markets in four Latin American countries found that this global factor has consistently and significantly explained returns in all the markets. This finding may have important implications across countries for policymakers and investors in their decision making process. Conversely, results from Indonesia, also an emerging market economy as documented by Gupta, Chevalier, and Sayekt (2001) established a weak causality that flows from exchange rate to stock prices depending on the sub periods been considered. They also document that between stock prices and exchange rate, no stable causality relationship exist, suggesting that the Jakarta stock market efficiently incorporated much of the exchange rate information in its stock price changes and closing market index.

Meanwhile, for a group of countries too, Laichena and Obwogi (2015) found exchange rate to be negatively significant to stock returns. The panel study which focused on three East African countries of Uganda, Kenya, and Tanzania, between 2005 and 2014 was with a view to investigate how stock returns are determined by macroeconomic variables in East Africa. But while results vary from country to country in Muhammad, Rasheed, and Husain (2002), result obtained by Laichena and Obwogi seems to apply to all three countries in the study. However, the investigative study conducted by Parsva and Lean (2011) on Saudi Arabia, Egypt, Kuwait, Jordan, Oman, and Iran showed that before the 2007 Global Financial Crisis, a bidirectional causality relationship existed between exchange rates and stock prices in both the short-run and long-run for Oman, Iran, and Egypt. But during the crisis, the scholars found increased interactions between the markets. However, while Kuwait showed evidence of unidirectional causality which flows from exchange rate to stock prices, no evidence was found indicating the existence of any form of interaction between the stock markets in Jordan and Saudi Arabia. Again similar to results obtained by Muhammad, Rasheed, and Husain, the results on these Middle Eastern countries are somewhat country specific.

Furthermore, a study by Chkili and Nguyen (2014) who employed a regime-switching model approach to explore the interconnectivity between exchange rates and stock market returns in a group of countries known as the BRICS (an acronym for Brazil, Russia, India, China and South Africa in that order) found that each of the countries has grown through adapting either a high volatility regime or a low volatility regime. But through the Markov switching VAR models the scholars were able to show evidence suggesting that exchange rates are determined by the stock markets for stable as well as turbulent periods. These

empirical insights would be important for portfolio investors who may require them for currency risk hedging.

In addition, Zhao (2010) establishes that a bidirectional volatility spillover effects exist between stock exchange market and the foreign exchange market. The author regarded such phenomenon as an indication that future volatility in the foreign exchange market is greatly affected by past upheavals in the stock market and vice versa. He submits that the relationship between the real effective exchange rate of the Renminbi (RMB) and stock prices is not a stable long-term equilibrium relationship. The study which employed the VAR and GARCH models and January 1991 to June 2009 monthly data further indicated the absence of mean spillovers between the foreign exchange and stock markets.

Several studies have documented results that showed a unidirectional interaction between the stock market index and the exchange rate variable. Among them is a study by Agrawal, Srivastav, and Srivastava (2010) who reported a unidirectional flow of causal correlation from stock returns to exchange rate. Also Muktadir-al-Mukit's (2013)investigative study to determine how stock market performance is influenced by interest rates and exchange rates in Bangladesh using monthly time series data over the period of 1997 to 2010, reported aone-way causal association from stock market index to exchange rate. Subsequent findings by Kalyanaraman and Tuwajri (2014) support the results obtained by earlier scholars on the issue of unidirectional causality. The point of divergence however is that, while Agrawal, Srivastav, and Srivastava and Muktadir-al-Mukit documented causality flowing from stock market index to exchange rate, Kalyanaraman and Tuwajri documented a flow in the

reverse direction. Gan et al. (2006) and Sohail and Hussain (2009) were among early scholars to have also documented similar findings.

Meanwhile, Mlambo et al. (2013), in a study that assessed currency volatility effects on the Johannesburg Stock Exchange (JSE) index sort to determine whether any form of interaction exists between volatility in exchange rate and stock market performance. The analysis of the 2000 to 2010 data using GARCH model showed a very weak relationship between the stock market and currency volatility. Though the scholars are of the opinion that a weak correlation between stock market and volatility of currency did suggest that the JSE can be labeled unsafe for foreign investors, nevertheless, they cautioned all manner of stakeholders including bankers, investors, and portfolio managers to remain watchful of spillover effect entering into the stock market from foreign exchange rate.

On sectoral basis, an investigation from India was conducted by Jambotkar and AnjanaRaju (2018) to determine the impact of macroeconomic aggregates document results that showed the combined effects of macroeconomic variables on each of the sectoral indices as significant whereas the selected macro factors indicated less explanatory powers. They arrived at these results by analyzing monthly data from January 2007 to December 2016 with the help of econometric techniques including unit root test, ordinary least square model (OLS) and correlation analysis. The macro factors of their study include bank interest rate, exchange rate, inflation, price of crude oil, and the foreign exchange reserves. Their study concluded that a high strength of relationship exists among all the selected sectors because they are closely linked together, a situation which they say is an important signal to investors to diversify their portfolio.

Law and Ibrahim (2017) in an investigative study using data on Malaysia reported that on sectoral basis, macroeconomic shock engenders different results though with relative similarity in temporal response. However, the authors posit that among other monetary policy measures, exchange rate shock has the largest effect on the finance sector. The scholars emphatically stated that monetary policy measures including those on exchange rate will be more influential on sectoral returns than they will be on the goods market.

2.3.2 Exchange Rate Volatility and Stock Returns in Nigeria

In Nigeria, studies conducted by different scholars and for different periods reported divergent results. For Zubair (2013), using Johansen cointegration and Granger causality methods on monthly data for the period 2001 to 2011 with a view to determining the effect of the global financial crisis on Nigeria found evidence that suggest absence of a direct linkage between ASI and exchange rates during the period of the crisis. Moreover, Okoli's (2012) quest to determine the role (if any) of exchange rate in predicting sectoral stock price indices obtained results indicating that ASI including banking index among others, are significantly predicted by the exchange rate but with an inverse relationship. Similar results to Okoli's was documented by scholars including Kasman, Vardar, and Tunç (2011), Tunisia, Mouna and Anis (2013), Nurazi and Usman (2016), and Nurazi (2016).

On the contrary, Nkoro and Uko (2013) though like Okoli (2012) examined the impact of macroeconomic variables on stock returns on the NSE. The authors employed GARCH-M model to analyse an annual data for the period 1985 to 2009. But unlike Okoli, these authors documented that the predictability of stock market returns through the exchange rate variable proved slightly divergent. Their results revealed that stock returns in Nigeria

are not significantly influenced by exchange rate. A much later study by the same scholars (Nkoro & Uko, 2016) documented a negative relationship between stock market price volatility and exchange rate volatility in Nigeria. Though the later study when compared to Okoli's reported time varying volatility, an apparent difference between both studies is that Okoli used monthly data for a shorter time while Nkoro and Uko used annual data for a considerable longer period. Nkoro and Uko result followed what Bilson et al. (2001) documented many years earlier.

In another development, a study by Osamwonyi and Evbayiro-Osagie (2012) found the exchange rate variable as a predictor of market index in the Nigerian capital market. The authors employed Vector Error Correction Model (VECM) and annual data spanning the period 1975 to 2005 to achieve their objectives. Their result is in line with earlier result obtained by Maku and Atanda (2010) who found strong evidence to believe that long run macroeconomic indicators including exchange rate critically determine stock market performance. However, the macroeconomic variables, based on the authors' submission, simultaneously and significantly determine the capital market performance. The findings of Osamwonyi and Evbayiro-Osagie as well as Maku and Atanda, confirm the symmetric connection between the stock market and stock returns to the effect that both can be used interchangeably.

Furthermore, despite the use of quarterly data spanning 1985 Q1 to 2009 Q4 employed by Olugbenga (2012), the author found a significant exchange rate influence on stock price even though this effect is positive in the short run and negative in the long run. Whereas, Oyinlola, Adeniyi, and Omisakin (2012) used daily data from 2nd January 2002 to 11th

August 2011 with structural break, they found a no long run relationship between exchange rate and stock prices. The difference in their results may not be unconnected with the dynamics of the period of data used considering the fact that both studies used the Johansen cointegration method to analyse their data. However, akin to this result is the weak effect of exchange rate on stock price volatility as documented by Omorokunwa and Ikponmwosa (2014).

Besides, Amassoma and Rukayat (2014) on the strength of quarterly data spanning the period 1980 - 2014 to examine the relationship between exchange rate volatility and stock market performance using multiple regression analysis documented that the relationship between both variables is positive but statistically insignificant. This result is in agreement with result obtained a year later by Asekome and Agbonkhese (2015) in a study that examined the macroeconomic variables responsible for the 2008 stock market bubble and meltdown, and its subsequent recovery. Though Amassoma and Rukayat's result clearly contradict that of Olugbenga (2012), this development further lends support to the argument that data dynamics is a major factor in empirical results of studies. Though it may not be correct to reach an absolute conclusion in this regard, it may however provide a good reason to reach such conclusion when in consideration of a number of similarities between any two studies; results obtained still come out contradictory.

Additionally, Osisanwo, and Atanda (2012) in analyzing the determinants of stock market returns using OLS and time series data for the period 1984 and 2010 found exchange rate as one of the main determinant of stock market returns in Nigeria. In the same way, Emenike-Kalu and Okwuchukwu (2014) used GARCH-X model to examine how stock market return

volatility is instigated by changes in macroeconomic variables. The scholars' results from the analysis of January 1996 to March 2013 data show that USD/₦ exchange rate positively influences stock market return volatility in Nigeria. Umoru and Asekome (2013) also reported positive cointegrating relationship between USD/₦ exchange rate fluctuations and stock price on the NSE.

2.3.3 Interest Rate Variability and Stock Returns

Interest rate is a macroeconomic variable and an effective monetary policy tool which is often manipulated to achieve certain predetermined economic and financial objectives. Like exchange rate, the sensitivity of stock returns to variations in interest rate has attracted considerable attention among scholars and even practitioners both in the distant as well as the recent past. The focus of this section as with the previous one on exchange rate volatility and stock returns is in determining whether or not there exist an association between the two variables, how significant is the correlation, and what direction is the flow of causality between them.

Ballester, Ferrer, and González (2010) used a univariate GARCH-M model to study stock returns of industries in Spain, and found evidence of significant but negative correlation between changes or volatility of interest rate and stock returns. Their results agreed with Elyasiani and Mansur (2004) earlier findings which indicated that volatilities of interest rates both in the long-term as well as short-term do exert significant though differential impacts on bank portfolio return generation process. The authors however submit that the direction and extent of the effect are concomitant upon whether the equation of the mean return incorporates the long-term or the short-term interest rate. To arrive at these

conclusions, a multivariate GARCH model was used by the scholars to analyse a sample of daily data over the period 1988-2000.Supporting this result, Moya-Martínez et al. (2015) contend that the measure of difference of interest rate exposure varies substantially across industries with the banking industry listed among those considered more vulnerable to interest rate risk.

Furthermore, in a cross border study to examine how changes in German monetary policy (particularly changes in central bank interest rate) affect stock index, Stevenson (2015) found evidence to the effect that information transfer across borders regarding a large number Bundesbank rate changes results in significant reaction in both German bank stocks and general equities. The author noted that the rate change effected by Bundesbank during the years leading up to European Monetary Union (EMU) has engendered reactions in most non German bank stocks in a way that no other country's policy has. The study examined a total of 29 interest rate changes over the period 1987 to 1998. Similarly, Elyasiani and Mansur (2003) also found that banks in the U.S., Japan and Germany are sensitive to cross-country macroeconomic shocks and that the volatilities of bank stocks in the three countries are highly interdependent. The spillover effect of U.S. macroeconomic shocks to Japan and Germany is more pronounced than the other way around. In a related study, interest rate and its variability are found to explicitly influence both the first and second moment of bank stock distribution, respectively (Elyasiani & Mansur, 1998).

Notwithstanding the foregoing, a study by Priti (2016) is a confirmation that specificity of volatility spillover is not only limited to cross-country studies. Evidence obtained from a multivariate study that employed EGARCH for a sample of 70 commercial banks found

results which indicate that mean and volatility spillovers exist for both long-term and short-term interest rates for three U.S. bank portfolios.

Numerous scholars have focused on determining the robustness and trend of the association between interest rate and stock returns. Among them are Jain, Narayan, and Thomson (2011) who used the EGARCH model and data covering the period 1992 to 2007 to establish evidence of a significant negative relationship between stock returns and interest rate. Likewise, Nurazi and Usman (2016) who employed Pooled Least Square model and data over the period spanning 2002 to 2011 on 16 Indonesian banks found a negative but significant relationship between interest rate and bank stock returns.

Furthermore, Chen, Chen, and Chen (2011) sort to determine what different impacts the expected and the unexpected variations in the interest rate would have on the daily stock index returns. They found empirical results which showed that stronger impact on Taiwan stock market returns comes from unexpected interest rate change. Moreover, the scholars found interest rate as even having stronger impact on Japanese stock market. Similar finding was earlier reported by Ballester, Ferrer, and González (2011) who employed parametric and nonparametric methods of analysis to examine bank stock returns' sensitivity to interest rate variations. They however noted that variation in interest rate can result in remarkable decline in its influence on bank stock returns, a phenomenon which they attributed to the introduction of Euro.

Additionally, Olugbode, El-Masry, and Pointon (2014) found evidence that indicated a greater influence of long term interest rate risk as compared to short term interest rate risk

on stock returns. The study which analyses data from 31 U.K. non-financial industries from 1990 to 2006 using EGARCH-M model further argued that a notable decrease was observed in competitive industries exhibiting higher return volatility compared to their counterparts in concentrated industries following a decrease in interest rate brought about by the introduction of the Euro. Notwithstanding the failure of their results to mention the direction of the relationship, the study is somewhat complementary to Ratanapakorn and Sharma (2007) to the extent that it revealed the intensity of the influence of the interest rate variable on stock returns.

In a related development, Benaković and Posedel (2010) conducted a study that analyses fourteen stocks on the Croatian capital market and their relationship with some macroeconomic variables using monthly data from January 2004 to October 2009. The result of their study shows a positive relationship between stock returns and interest rate. This result deviates from the standard and more general result of significant negative relationship between the variables. Interestingly, other scholars who found and document positive correlation between stock returns and interest rate include and Quadir (2012).

But contrary to the findings of the above authors, Ryan and Worthington (2004) documented that interest rate whether in the short or medium term, and even when volatile, has great influence on bank stock return. They noted however that long term interest rate appeared insignificant a factor in return generating process of the Australia bank in the period of study. Their study employed the GARCH-M model for its analysis. In the same way, Choi et al. (1992) in a study of 48 U.S. banks from 1975 to 1987 affirm that the standard result whereby interest rate significantly determine stock returns holds true in their

study, a phenomenon which they say is directly attributed to the role of interest rate in both the return and cost of financial institutions. A handful of scholars posit that the interest rate risk faced by banks emanates from their role as financial intermediaries (Ballester, Ferrer, & Gonález, 2010).

Besides, a study by Alam and Uddin (2009) using monthly data over the period spanning January 1988 to March 2003 to investigate the empirical correlation between interest rates and stock index, cutting across fifteen countries that included both the developed and the less developed ones showed that none of the stock markets follow the random walk model in a test for stationarity of market return. This is an indication that the markets are inefficient and weak. However, the authors found evidence of a negative but significant relationship between share prices and interest rates for all countries in the study. Also, significant negative relationship was found in only six of the countries between interest rates variation and fluctuation in share prices. A more recent result from the analysis of data obtained on Sri Lanka between 2007 and 2013 also shows that the association between stock index and interest rate is negative and significant with interest rate Granger causing stock returns (Amarasinghe, 2015).

Several studies on the interaction between stock market index and interest rate abound in literature though with diversities of results. Ferrer, Bolós, and Benítez (2016) found considerable difference between stock returns for major European countries and changes in 10-year government bond yields and posit that variation for a specific time period depends on the time horizon considered. However, the greatest long-term interdependence between equity returns and interest rates was found in the U.K., with the highest level of connection

observed in 2008 at the inception of the global financial crisis. Tripathi and Ghosh (2012) in a study that focused on stocks of 18 commercial banks in India found a negative correlation between stock returns and interest rate. Though a weak correlation, it is yet an indication that interest rate variability is of significant consideration in stock index volatility for most banks in India. Other studies that document significant linkage between stock returns and interest rate include Kwan (2003), Verma and Jackson (2008), Tran (2013), Jeanchutima and Tangjitprom (2015) and Hajilee and Al Nasser (2017).

2.3.4 Interest Rate Variability and Stock Returns in Nigeria

The influence of the interest rate variable as monetary policy instrument and its attendant impact on stock returns has been documented by various scholars in the Nigerian context. Adeniji, Obansa, and Okoroafor (2018) in a study to analyse the influence of monetary policy shocks on stock market price volatility arising found interest rate as a significant monetary policy variable that explains stock market price volatility in both the short and long run. This result emanates from an analysis of monthly data from June 1999 to December 2016 using both the ARDL and the EGARCH models. Similarly, Ayopo, Isola, and Olukayode (2015) used the ARDL bound testing estimation techniques to examine the interaction between the Nigerian stock market and monetary policy instruments on the basis of data sourced from 1985 to 2013, and obtained results that indicated that ASI and interest rate are positively related.

However, an earlier study by Oseni and Nwosa (2011) that used annual data spanning the period 1986 to 2010 show some similarity to the study conducted by Babajide, Isola, and Somoye (2016) who used monthly data spanning January 1985 to December 2013. Both

studies used the EGARCH method for data analysis. But unlike Babajide, Isola, and Somoye who found and documented a significant response of stock prices to innovations in interest rate, Oseni and Nwosa reported a no causal relationship between volatility of interest rate and stock returns volatility. Though great similarity in data length between the studies may be observed, the apparent contradiction in the results may not be unconnected to the difference in their data structure as well as the variables of interest in each study. In line with Babajide, Isola, and Somoye, Oluseyi (2015) found significant relationship between interest rate volatility and stock market price volatility.

Omotunde and Nwokoma (2016) in an empirical study to determine the extent to which interest rate shock results in stock market volatility found that though interest rate shocks have been limited, policy pronouncements of interest and other monetary policy rate have influenced the behavior of stock market in Nigeria. Their results were obtained following the analysis of data spanning 1985 to 2014 using the ARCH/GARCH model. Likewise, Aliyu (2012) in an assessment of the effect of global financial crisis on Nigeria's stock market using GARCH/EGARCH model reported that unanticipated component as against anticipated component of MPR, a major monetary policy instrument, exerts destabilising effect on NSE returns. This result emanates from the analysis of monthly data between the period January 2007 and August 2011. The study is a confirmation Lucas (1972) postulation.

Adaramola (2011) investigated the impact of macroeconomic indicators on stock prices in Nigeria and reported a negative relationship between stock price and interest rate. The focus of the study on individual firms, for which it became unique, is an attempt to deviate

from the tradition focus on aggregate return index represented by ASI. Similarly, Okpara (2010) investigated the effect of monetary policy on Nigerian stock market returns and found that Treasury bill rate cum interest rate (a proxy for monetary policy) significantly determine long run stock market returns in Nigeria. Further evidence from this study indicates that interest rate which is negatively related to stock returns is a predominant source of returns fluctuations in the capital market.

Another important dimension to the relationship between interest rate and stock market can be noted in the study conducted by Abraham (2011). Here the author examined the relationship between the stock market and selected macroeconomic variables in Nigeria using error correction model on 1985 to 2008 monthly data and found that interest rate represented by minimum rediscount rate (MRR) otherwise often referred to as monetary policy rate (MPR) has a significant but negative short run relationship with stock market. However, Treasure bill, another proxy for interest rate used in the study, though negatively related to stock market but insignificant. This study shows that results obtain for any particular variable is largely dependent on the proxy used for that variable.

Inegbedion (2012) is one of the very few who found interest rate an insignificant predictor of stock price changes. Others include Malaolu, Ogbuabor, and Orji (2013) who documented that interest rate is not a determinant of stock price movement in Nigeria. This particular result and those of other scholars most of whom reported significant and positive relationship between interest rate and stock prices deviates from the standard and more general result of significant negative relationship reported by other scholars from across the globe.

2.4 Literature Gap

From the review carried out so far, it is evident that different results were obtained by different scholars. Even in studies that encompassed a number of countries, it is not uncommon to obtain mixed results. Also, whereas most studies are carried out on advanced and emerging market economies, little attention has been given to Africa and particularly Nigeria. The studies conducted on Nigeria are, as with those conducted in other places, do not only place more focus on entire capital market (using ASI as proxy) but characterized by mixed findings. The need for a study that focuses more on a segment rather that the entire stock market considering the paucity of literature in this area becomes therefore imperative. The choice of the exchange rate and the interest rate variables is majorly because they are the two most important financial prices that determine banking sector performance since SAP. The need therefore for a different study as a way of confirming earlier studies

More importantly, this study is peculiar in the sense that the 2016 exchange rate devaluation introduced a different dimension to the study on stock returns and their relationship to determining factors such that was absent in previous studies, an aspect which to my knowledge is yet to be addressed. It is therefore with the view to fill these apparent research gaps that this particular study is being conducted.

2.5 Conclusion

Thus far, this chapter has focused on the review of literature - theoretical as well as empirical. Specifically, the review considered stock returns, exchange rate volatility, and interest rate variability, in addition to the interaction among these variables. Besides the

review of each of the concepts, the linkage between exchange rate volatility and stock returns as well as interest rate variability and stock returns were also reviewed extensively leading to the establishment of the literature gap which the study seeks to fill.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter addresses the methodological aspect of the study. It is divided into different sections with each focusing on specific area which include theoretical framework, model specification, justification of variables, data and sampling method, methods of analysis, as well as the concluding section.

3.2 Theoretical Framework

3.2.1 Modern Portfolio Theory

The origin of modern portfolio theory is traceable to Markowitz (1952, 1959). His work entitled portfolio selection theory was one of the early works on financial assets theory. The propositions he advanced in his work became the basis for the development of later works in the field. The fundamental principle of his theory is woven around the "mean-variance" assumption which underscores the need to either hold variance constant while maximizing expected returns or hold expected returns constant with the aim to maximize variance. In other words, the theory expresses investors' preference for high return and low risk as against the reverse situation (Elton & Gruber, 1997).

However, the inability of the Markowitz's theory to deal with the influence of pervasive risk led Sharpe (1964), Lintner (1965), and Mossin (1966) to develop the capital assets pricing model (CAPM), a model that assumes return as a function of risk. It emphatically posits that to increase return is to increase risk. In simple terms, the model considers

expected returns as the sum of two terms – the remuneration due to an investor for surrendering the use of his fund to another in riskless environment and the recompense an investor receives for risk bearing. Though noted for its appeal for modeling risk-return relationship, the CAPM fell short of becoming a one-fit-all model of asset pricing due to its inability to incorporate multiple risk variables within the model, a situation that substantially reduced its popularity

To provide for the short coming of the CAPM, an alternative theory was proposed by Ross (1976) called the Arbitrage Pricing Theory (APT). Despite being an alternative theory through which risky assets are priced, the APT does retains the intuitive outcome of the standard CAPM. Unlike the CAPM however, the APT is an attempt to relate returns to risk for alternate investment decisions made by investors at different time periods and under the prevalence of diverse risk exposures. Though the APT may not necessitates that investors in the decision be mean-variance maximizers, but that returns to investors be a function of systematic determinants that can be itemized.

Specifically, the APT is based on a linear return generating process. It is a multifactor model that captures assets actual returns into expected part and unexpected part where the unexpected part consists of unanticipated shocks to “k” risk factor as well as unanticipated firm specific shock. The appropriateness of APT as an alternative asset pricing model stems from the intuition behind the CAPM. As an asset pricing model, the APT relates the assets expected returns to its risk factor through the factors’ risk premium and the sensitivity of assets’ returns to the risk factor (Roll & Ross, 1980).

In line with the APT therefore, and specifically in relation to objective three of this study, the relationship between stock returns and its determining risk factors of exchange rate volatility and interest rate variability are as captured in the framework as Figure [3.1] shows.

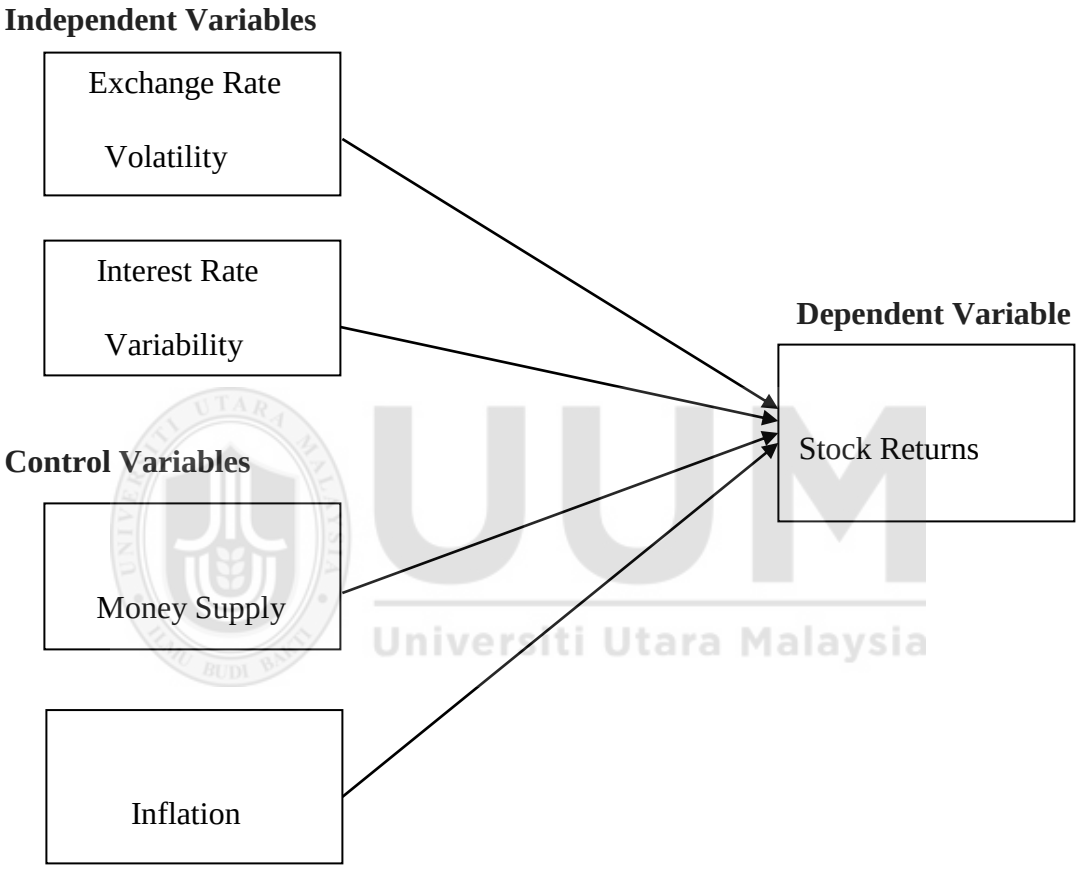

Figure 3.1:

Research Framework

The framework simply asserts that the expected return of an asset is a function of systematic risk factors that influences it. Among others, the macroeconomic sources approach of Chen, Roll, and Ross (1986) in which a set of macro variables are considered

as risk factors that explain asset returns is employed in this study (Balvers, Stivers, & Lee-Chin, 2016).

3.3 Model Specification

To ensure the achievement of the study objectives, particularly as regards objectives (ii) and (iii), and in line with literature on theoretical framework as discussed in Section 3.2, exchange rate volatility model and asset pricing model are developed.

3.3.1 Current Exchange Rate Volatility Model

Researchers have been unanimous in their argument that modeling of exchange rate volatility is a herculean task. The divergence of opinion in this regard has been reflected in the different models that have been generated to capture exchange rate volatility (McKenzie, 1999). Among the popular measures in use are the first order difference measure, the standard deviation of exchange rate growth, and the coefficient of variation of exchange rate growth. More recently, the Autoregressive Conditional Heteroscedasticity (ARCH) model developed by Engle (1982) and its subsequent Generalized Autoregressive Conditional Heteroscedasticity (GARCH) developed by Bollerslev (1986), have been widely employed as a financial time series approach to modeling volatility. The approach encompasses two distinct specifications in one model – the conditional mean and conditional variance. To measure volatility, this method is adopted for use in this study.

According to Nelson (1991), the test for ARCH effect on a series is a necessary prerequisite for conducting GARCH model estimation. The test which is normally conducted on the autoregressive (AR) test result residuals, provides the needed justification for the use of the

GARCH model (assuming a positive ARCH effect result), otherwise, such result is invalid and unreliable.

The recognition of the difference between conditional and unconditional volatility led Engle (1982) to develop the ARCH model. In its simplest form, the first order autoregressive or AR (1) ARCH family model is as given in Equation [3.1]

$$y_t = \beta y_{t-1} + \varepsilon_t \quad [3.1]$$

where y_t is a random variable, β is the parameter to be estimated, y_{t-1} is the lag of the random variable y_t, and ε_t is the white noise error term, which can generally be expressed as $\varepsilon_t \sim$ iid (0, σ^2). The conditional variance of y_t is given by the symbol σ^2, while the unconditional variance is given by $\frac{\sigma^2}{1-\beta^2}$. Engle (1982) submits that a better forecast variance is achieved when additional news from previous period is allowed to impact on the forecast interval. The introduction of exogenous variable x_t, in line with the heteroscedastic standard approach, helps to predict the variance of the equation having zero mean. This can be represented by Equation [3.2]

$$y_t = \varepsilon_t x_{t-1} \quad [3.2]$$

From Equation [3.2], the variance of y_t is $\sigma^2 x_t^2$ with the exogenous variable becoming the function of the forecast interval. In this representation, specific cause of change is required in the variance as against assuming that conditional mean and variance will evolve

overtime. A simple model with previous series realization as a function of the conditional variance is as shown in Equation [3.3]

$$y_t = \varepsilon_t h_t^{1/2} \text{ or } y_t | \psi_{t-1} \sim N(0, h_t) \quad [3.3]$$

$$y_t = \alpha_0 + \alpha_1 y_{t-1}^2 \quad [3.4]$$

where Var (ε_t) = 1 and *h* which represents the variance function that is expressed generally as $h_t = h(y_{t-1}, y_{t-2, \ldots}, y_{t-1}, \alpha)$ with *p* referring to the order of the ARCH process. α_0 and α_1 are parameters – constant and coefficient - to be estimated. Ψ is a symbol that represents information set.

Bollerslev's (1986) generalization of the ARCH model gave birth to GARCH model. This extension was made to accommodate flexible lag length and longer memory. The model allows the modeling of conditional variance based on autoregressive moving average (ARMA) process. One of the criticisms raised against this model include its dependence on previous periods error term which bear no relationship with the direction of relationship. Its failure to account for the leverage effect as well as distributional asymmetry is yet another (Yoon & Lee, 2008).

According to Baillie and Bollerslev (1992), the conditional mean is determined conditional upon information which is given in time *t-1*. The conditional mean model is as presented in Equation [3.5]

$$E_{t-1} = (y_t) \equiv \mu_t \quad [3.5]$$

where E_t denotes expectation or conditional mean and μ_t the stochastic error term. The conditional mean innovation process $\{\varepsilon_t\}$ is given by Equation [3.6]

$$\varepsilon_t \equiv y_t - \mu_t \quad [3.6]$$

The conditional variance on the other hand is given in Equation [3.7] as

$$Var_{t-1}(y_t) = E_{t-1}(\varepsilon_t^2) \equiv \sigma_t^2 \quad [3.7]$$

The measurability of both μ_t and σ_t^2 are subject to the information set from time *t-1* with a finite assumption and a probability of one. Also we define $\{y_t\}$ as the time variant serially uncorrelated innovation process with zero mean and which is considered as time *t* conditional variance innovation. This is as given in Equation [3.8]

$$V_t = \varepsilon_t^2 - \sigma_t^2 \quad [3.8]$$

where V_t is the unconditional variance having zero mean. From the foregoing, and in line with the standard ARMA *(p, q)* model, the GARCH *(p, q)* model is developed as given in Equation [3.9]

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \alpha_i \sigma_{t-i}^2 + \sum_{j=1}^{q} \beta_j \varepsilon_{t-1}^2 \quad [3.9]$$

where $\omega > 0$ and the coefficients α_i and β_j are restricted in order that the lagged values of ε_t^2 can all be positive.

With prediction errors modeled as a function of time, system parameters, exogenous and lagged endogenous variables, and past prediction errors, the ARCH model would surely be considered a researcher's delight for forecasting future volatility of a series. But Nelson (1991) identified some salient reasons why the GARCH model may not be totally suitable for all time forecasting including the challenge of not been able to say from GARCH estimation results if the conditional variance would "persist" or not. To accommodate the concerns raised by Nelson (1991), the proposed Exponential GARCH (EGARCH) model as given in Equation [3.10] is used to address objective (ii) of the study.

$$log(h_t) = \gamma + \sum_{j=1}^{q} \varphi_j \left| \frac{\varepsilon_{t-j}}{\sqrt{h_{t-j}}} \right| + \sum_{j=1}^{q} \xi_j \frac{\varepsilon_{t-j}}{\sqrt{h_{t-j}}} + \sum_{i=1}^{p} \delta_i log(h_{t-i}) \qquad [3.10]$$

The autoregressive root is used for the determination of the extent of volatility while the sum of γ and φ indicate the degree of volatility persistence such that volatility is considered present if γ plus φ equates to one. Volatility is however considered absent when the sum of the γ and φ parameters is less than one. For a value greater than one, volatility is said to overshoot. ξ is the model's prediction error.

3.3.2 Asset Pricing Model

The model for this study in its functional form is as presented by Equation [3.11].

$$STR = f(ERV, IRV, MYS, INR) \qquad [3.11]$$

where

STR = Stock returns (in ₦ value)

ERV = Exchange rate volatility (conditional variance)

IRV	=	Interest rate variability (in percentage)
MYS	=	Money supply (in billions of ₦)
INR	=	Inflation rate (in percentage)

Following Jorion (1990) and subsequently, Khoo (1994) as well as Bredin and Hyde (2011), and in line with the APT model of asset pricing, the functional form of the model for this study is transformed to its econometric form as represented by Equation [3.12].

$$STR_t = \alpha + \beta_1 ERV_t + \beta_2 IRV_t + \beta_3 MYS_t + \beta_4 INR_t + \varepsilon_t \quad [3.12]$$

where α is constant parameter, $\beta_{1,\ldots,}\beta_4$ are coefficients for the variables, ε_t is the stochastic or random error term; $\varepsilon_t \sim iid\ N(0, \sigma^2)$.

3.4 Justification of Variables

This section provides the operational definition for each of the variables used in this study. Each definition encompasses the variable measurement, hypothesis, as well as evidence of usage in a previous study.

3.4.1 Stock Return

Stock return *(STR)* is the difference between the prices of a common stock at two consecutive time periods. It is the yield that accrues to a stock investor due to variation or deviation in stock price. It is measured as the ratio of the natural log of time *t* stock price divided by the stock price in time *t-1*, i.e. $STR_t = lnSP_t / lnSP_{t-1}$. In order to obtain monthly returns, an estimation of the continuously compounded return was undertaken. This

measure of stock return was previously used in studies conducted by Haugen, Talmor, and Torous (1991), Faff, Hodgson, and Kremmer (2005), Benaković and Posedel (2010), Kumari and Mahakud (2015), and Jambotkar and AnjanaRaju (2018).

3.4.2 Exchange Rate Volatility

Exchange rate volatility *(ERV)* is herein defined as the dynamic and rapid deviation that occurs in the nominal mean value of a country's currency in terms of another over a short period of time. To measure volatility therefore, this study uses the GARCH (1, 1) model. The GARCH (1, 1) model is a time series model that enables data characterised by distributional properties encompassing both volatile and tranquil periods to be estimated (Bollerslev, 1987). It provides the best approach to measuring the unequal variances which are the distinct characteristics of most financial time series including exchange rate.

The GARCH (1, 1) model also makes possible the computation of prediction for each error term (Engle, 2001). It measures future variance in terms of current observations. An advantage of the GARCH (1, 1) method over others is that it accounts for both predictable and unpredictable component of a series. This measure of volatility was used in previous study by Elyasiani and Mansur (1998), and Jordaan et al. (2007). Sub-section [3.6.1] contains details of the GARCH (1, 1) approach. To obtain ERV data used for the analysis in this study, monthly data of nominal exchange rate for ₦ vis-à-vis USD from 2010 to 2017 was used (Vee, Gonpot, & Sookia, 2011). It is hypothesized that an increase in exchange rate (depreciation) will result in a decline in stock price/returns due to inflation expectation.

3.4.3 Interest Rate Variability

Interest rate variability *(IRV)* as used in this study defines the uncertainty that attends to the interest rate variable such that the series generated over time fluctuates considerably. In other word it is the change in the value of interest rate that occurs over time in response to the dynamics of an economic system. While interest rate may be considered as the cost which a borrower bears for the use of funds he received from a lender for a predetermined period of time, to the lender, it represents a surplus that is received over and above a stated sum given out ass loan to a borrower for a specific time, at the expiration of which both the original sum (capital) as well as the expected surplus would have been completely returned.

The Inter-bank call rate, being a rate charged by a lender bank on fund given as loan to a borrower bank is used as proxy for interest rate. The Inter-bank rate among other rates is chosen due to its specificity to the banking industry and its responsive nature to market forces. It is believed that the Inter-bank rate does provide the type of market driven variability in interest rate that will help the understanding of its impact on stock returns in a way that the study seeks to examine (Chen, Chen, & Chen 2011). Also being the most variable rate in the money market, this rate is believed to be the best suited rate that explains interest rate variability effect on stock returns in such a way that no other rate does.

IRV is therefore measured as the first difference in the level of interest rates between two consecutive observations. It is given as $\Delta INT_t = 100 * [INT_t - INT_{t-1}] / INT_{t-1}$. This measure of variability was previously used in a study by Alam and Uddin (2009), Ćorić, and Pugh (2010), and Moya-Martínez et al. (2015). It is hypothesized that the occasional change in

the base rate set by the monetary authorities as well as the interaction of monetary policy measures results in interest rate variability, and that interest rate and stock returns are negatively related.

3.4.4 Money Supply

Money supply *(MYS)* is herein considered as the total stock of money circulating in an economy. The constituents of what stock is used are dependent on the items considered in the measure that is adopted. In this study, broad money (i.e. M2) is the adopted measure of money supply. M2 consists of the basic elements of M1 (cash and current account deposits) as well as "near money" such as mutual funds, money market securities, savings account deposits, and other time deposits. Scholars who have used this measure of money supply previously include Chung and Ariff (2016), Onoh and Obioma (2017), as well as Ridderstaat and Croes (2017). In line with liquidity preference hypothesis, it is hypothesized that an increase in money supply has a positive effect on stock price and hence returns (Chen, Chen, & Chen 2011).

3.4.5 Inflation rate

Inflation rate *(INR)* is simply the measure that indicates the general price level of goods and services and by implication the purchasing power of a currency at a given time. It is often referred to as consumer price index (CPI) which simply measures the percentage change in a market basket (containing representative consumer goods and services) between two consecutive time periods e.g. week, month, or year. Among studies that have previously used this measure of inflation are Jiranyakul (2016), Goolsbee and Klenow (2018). The hypothesis concerning inflation rate is that, it can either have a positive or negative relation

with stock returns depending on the strength of the demand or supply shock on the economy (Hess & Lee, 1999).

3.5 Data and Sampling Method

The data for this study consist of the aggregate stock returns data for all commercial banks in Nigeria whose stocks are quoted on the Nigerian Stock Exchange (NSE). The banking sector monthly price index is used as proxy for stock price from which the stock returns was computed. The computation of the returns was done using the standard procedure (Jaffe & Westerfield, 1985). Also monthly data on exchange rate, interest rate, money supply, and inflation rate, spanning January 2010 to December 2017 was obtained from the CBN website.

The choice of monthly data was made in order to make the inclusion of longer historical period possible. Additionally, following the argument by Choi, Elyasiani, and Kopecky (1992), clearing and settlements delays which appear significant in daily data are not found in monthly data. In relation to stock indices, monthly data ensures that distortions arising from non-trading and non-synchronous trading common to daily and weekly data are avoided (Marashdeh, 2005).

The study considers all the 22 commercial banks in Nigeria. The banks include Access Bank, Citi Bank, Diamond Bank, Eco Bank, Enterprise Bank, Fidelity Bank, First Bank (FBN), First City Monument Bank (FCMB), Guaranty Trust Bank(GTB) and Heritage banking company Ltd. Others are Jaiz Bank, Key Stone Bank, MainStreet Bank, Stanbic IBTC Bank, Sterling Bank, Sun Trust Bank, Polaris Bank, Union Bank, United Bank for

Africa (UBA), Unity Bank, Wema Bank, and Zenith Bank. The banks are categorized into international, national, regional, as well as non-interest banks in terms of the nature of the services they provide as well as the sphere of their coverage.

3.6 Method of Analysis / Estimation Procedure

This section gives an in-depth explanation of the statistical and time series methods including descriptive statistics, GARCH, EGARCH, and ARDL models employed to analyse the data for this study. To achieve objective (i) of the study, descriptive statistics were used and estimated results presented in tabular forms. The GARCH (1, 1) model was used to estimate the volatility of the exchange rate series and was followed by the estimation of the exchange rate volatility for periods ahead using EGARCH model with a view to achieving objective (ii) of the study. Also, the ARDL approach was employed to evaluate objective (iii) of the study. This is to enable both the estimation of long-run and short-run equilibrium relationship. Details of the procedure leading through to the ARDL model estimation are as presented from sub-section [3.6.3.] through to [3.6.3.7].

3.6.1 Descriptive Characteristics Estimation

An important aspect of descriptive statistics is that it allows for the estimation of parametric models. Most normal distributions with basic characteristics of expectation (mean) and variance fall into this model (Bickel & Lehmann, 2012). For the purpose of comparing the stock performance among banks, annual stock price of each of the banks was used in computing the annual returns using the returns formula $STR = ln(SP_t / SP_{t-1})$ while the average return for each of the banks is computed using $STR = ln(SP_t / SP_{t-1}) / n$ with n as

the number of years used. Same formula applies to the computation of the sectoral returns as well as the returns for the ASI.

3.6.2 Measurement of Exchange Rate Volatility

Among quite a number of non-linear models developed to measure a number of important features common to most financial data including volatility clustering, leptokurtosis, and leverage effect is the ARCH model. Developed by Engle (1982), the ARCH model makes clear the existence of explicit difference between conditional and unconditional variance where changes occurring in the former is considered as a function of past errors. Also, because conditional variance arises from past shocks to a series over time, it is considered non constant. The GARCH developed by Bollerslev (1986) has the advantage of accommodating easily the challenge of an infinite order of ARCH model.

Other methods for measuring volatility have proved unreliable. For example, it has been argued in literature that rolling variance method result has not only been unrealistic, but questionable in measuring a time series data (Campbell & MacKinlay, 1997). The scholars submitted that the outcome of any volatility measurement over a time period, with constant variance assumption, will only yield statistically inefficient and inconsistent outcome. It was in an effort to address such malady in volatility estimation results that the ARCH and GARCH models came to be.

3.6.2.1 Autoregressive Conditional Heteroscedasticity Model

The ARCH model, as an AR process is considered a better option to concurrently model the mean and variance of a series whenever it is suspected that the conditional variance is to be non-constant. It is generally as presented in Equation [3.13]

$$Y_t = \alpha + \beta' X_t + \varepsilon_t \quad [3.13]$$

where Y_t is a vector of the dependent variable whose character is random/stochastic, α is a constant, β' is a vector of coefficients of the independent variable to be estimated, X_t is a vector of the independent variable, and ε_t is a vector of white noise error term which is subject to an information set that is identically and independently distributed having zero mean and a non-constant variance i.e. $\varepsilon_t|\Omega_t \sim iidN\ (0, h_t)$.

The error process in the equation is expressed as in Equation [3.14]

$$\varepsilon_t = V_t\sqrt{h_t} \quad [3.14]$$

with V_t as the unconditional variance having a zero mean i.e. E(V_t) = 0, and h_t a conditional variance which is expressed as shown in Equation [3.15]

$$h_t = \gamma_0 + \sum_{j=1}^{q} \gamma_j \varepsilon_{t-j}^2 \quad [3.15]$$

3.6.2.2 Generalised Autoregressive Conditional Heteroscedasticity Model

The GARCH model which was developed by Bollerslev (1986), provides the avenue through which the conditional variance is modeled as an ARMA process, allowing for serial dependence of volatility and the capture of long lagged effect. It is generally written as GARCH (*p*, *q*), where *p* represents the order of the GARCH while *q* represents the order of the ARCH. The conditional variance is given as shown in Equation [3.16]

$$E_{t-1}\varepsilon_t^2 = h_t \quad [3.16]$$

On the other hand, unconditional variance is as given in Equation [3.17]

$$E_t(\varepsilon_t^2) = \varepsilon_t(V_t^2) = \frac{\alpha_0}{1-\sum_{i=1}^{p}\alpha_1\sum_{j=1}^{q}\beta_j} = \text{constant} \quad [3.17]$$

The autocorrelation function (ACF) is then used to identify and determine the order of the GARCH process using Equation [3.18]

$$h_t = \gamma_0 + \sum_{i=1}^{p}\delta_i h_{t-i} + \sum_{j=1}^{q}\gamma_j\varepsilon_{t-j}^2 \quad [3.18]$$

The estimation of the model using GARCH is therefore carried out using Equation [3.19]

$$y_t = \gamma_0\sum_{i=1}^{p}\delta_{i\delta}y_{t-1} + \sum_{j=1}^{q}\gamma_j\varepsilon_{t-j}^2 + \varepsilon_t \quad [3.19]$$

To determine whether or not volatility varies over time, we first test for the presence of ARCH effect in Equation [3.15]. The null hypothesis is that there is no ARCH effect. The

Lagrange Multiplier (LM) in combination with *F*-tests are used to test the null hypothesis. The decision rule is that null hypothesis will be rejected at 5 percent level of significant if the probability value is lower than 0.05. The confirmation of the presence of ARCH effect is an indication that volatility is time varying, and suggests that the GARCH will be a good fit for estimation.

3.6.2.3 Exponetial Generalised Autoregressive Conditional Heteroscedasticity Model

Nelson (1991) developed the EGARCH model to ensure effective consideration of the leverage effect in the estimation of volatility. It has been held in literature that EGARCH is a quite advantageous and the most powerful technique to measure volatility (Berument, Metin-Ozcan, & Neyapti 2001; Kontonikas 2004). Of particular importance is the technique's ability to capture asymmetrically the response of shock to bad news or good news. Other advantages include its ability to estimate uncertainty in log form thereby eliminating outlier effect from estimated results, while also ensuring that the estimated parameters are non-imposing and non-negative. It is in order to take advantage of these features of the model that it is employed in this study to measure exchange rate volatility.

Nelson's (1991) proposed EGARCH is given as represented in Equation [3.20]

$$log\sigma_t^2 = \theta + \sum_{k=1}^{p} \alpha_k \, log\sigma_{t-i}^2 + \sum_{k=1}^{q} \beta_k g(z_{t-k}) \qquad [3.20]$$

where $g(z_{t-k})\vartheta z_t = +\varphi\big(z_t - E(z_t)\big), \sigma_t^2$ is the conditional variance, θ, α, β, and ϑ are coefficients and z_t may be a standard nominal variable or come from a generalised error distribution. The sign and magnitude of z_t is allowed to exercise a separate effect on

volatility as a result of the formulation$g(z_{t-k})$. Restrictions on parameters are removed since $log\sigma_t^2$ may be negative. The basis for the consideration of this technique for this study is that the effect of good (positive lags) and bad (negative lags) are different, representing the asymmetric volatility of shock. The estimable model therefore is as given in Equation [3.21].

$$logy_t = \varphi_0 + \sum_{i=1}^{q} \varphi_1 y_{t-1} + \sum_{j=1}^{p} \delta_j log\varepsilon_{t-j} + \gamma \frac{\varepsilon_{t-1}}{y_{t-1}} \quad [3.21]$$

where $\gamma \frac{\varepsilon_{t-1}}{y_{t-1}}$is the leverage effect.

3.6.2.4 Diagnostic Checking

The test for serial correlation and cross term possibilities was conducted on the model to ascertain the presence of ARCH effect. Also an LM test on the estimation residual was also conducted to decide whether to accept or reject the null hypothesis.

3.6.3 Autoregressive Distributed Lag Method

The ARDL method is a least squares regression technique that encompasses within a single equation the lag of both the dependent and explanatory variables. The representation of the model is normally in the form of ARDL *(p, q_1, q_2, q_3, ..., q_k)*, with *p* representing the lag of the dependent variable, while the *q*variables represent lags of independent variables. The general model is shown in Equation [3.22]

$$\Delta y_t = \varphi_0 + \varphi_1 \Delta y_{t-i} + \varphi_2 \Delta y_{t-i} + \ldots + \varphi_n \Delta y_{t-k} + \delta_1 y_{t-i} + \delta_2 y_{t-i} + \cdots + \delta_n y_{t-k} + \varepsilon_t \quad [3.22]$$

where y_t is a vector of stock returns variable, and Δy_t results partly from a change and lagged values of itself as well as a distributed lag component of other explanatory variables, ε_t is the random disturbance term. The variable φ_i represents the coefficient of the lagged variables of Δy_t, and δ_i the coefficient of the lagged variables of y_t.

An advantage of the ARDL over other models is that it provides better long run relationship estimation result for serial variables compared to other methods including Engle-Granger test of Granger (1987), Fully Modified OLS (FMOLS) method by Philips and Hansen (1990), as well as the maximum likelihood method of Johansen (1988, 1991) and Johansen and Juselius (1990). Additionally, the ARDL incorporates a dynamic VECM with the ability to combine both long run equilibrium with short run dynamics and still retaining the long run information. It also provides the advantage of having a blend of I(0) and I(1) variables in a single equation set-up (Pesaran et al., 2001).

Though used by researchers for quite a long time, the ARDL method was made popular by the works of Pesaran and Shin (1999), Pesaran, Shin, and Smith (2001), and Nayaran (2005). It is reputed as being useful regardless of the order of integration of the variables in use and capable of yielding robust results even when a small size sample is used. Its cointegration technique is also considered better when compared to others.

3.6.3.1 Unit Root Test

Unit root test is a test conducted on a time series to determine its stationarity status using an AR model. The necessity of unit root test in time series econometric model have been emphasized by economists over the past decades in order to avoid spurious results (Gujarati & Porter, 2008). Since a non-stationary variable contains a unit root, a combination of two non-stationary variables can result in a meaningless regression results (Brooks, 2008).Because unit root is found to be present in most financial time series data considering evidence from the past studies, unit root test is therefore a necessity (Montgomery et al., 2008). To do this, variables are integrated (through differencing) either to I(1) or I(d) in order to achieve stationarity.

The test for unit root has been widely accepted as a well-known property of macroeconomic variable since the well-known paper of Nelson and Plosser (1982) cited in Granger et al. (2000). Among the various methods through which unit root test can be conducted are Dickey-Fuller (DF) test, Augmented Dickey-Fuller (ADF) test, Phillips-Perron test, as well as Kwiatkowski et al. test. The most popular of these tests being the DF test was first developed individually by Dickey (1976) and Fuller (1976) and jointly by Dickey and Fuller (1979, 1981).

The DF test which is based on the AR(1) process which addresses three different cases depending on the nature of the time series. These include:

A no constant and no trend series – Random walk process

Level: $Y_t = \rho Y_{t-1} + \varepsilon_t$ [3.23]

First Difference: $\Delta Y_t = \gamma Y_{t-1} + \varepsilon_t$ [3.24]

With constant and no trend

Level: $Y_t = \alpha + \rho Y_{t-1} + \varepsilon_t$ [3.25]

First Difference: $\Delta Y_t = \alpha + \gamma Y_{t-1} + \varepsilon_t$ [3.26]

With constant and with trend

Level: $Y_t = \alpha + \lambda t + \rho Y_{t-1} + \varepsilon_t$ [3.27]

First Difference: $\Delta Y_t = \alpha + \lambda t + \gamma Y_{t-1} + \varepsilon_t$ [3.28]

where $\Delta = (1 - L)Y_t$; t represents the trend variable and ε_t is the stochastic term. Conditional upon the null hypothesis of H_0: $\rho = 1$ or H_0: $\gamma = 0$. H_0 can be rejected on the ground that Y_t possesses the unit root property. The choice of which of the appropriate equation to use is dependent on the result of the time series plot.

The ADF test, which is an extension of the DF test, gives room for the error term to possibly be autocorrelated. Also this generalization of the DF is to accommodate general ARMA and ARIMA models. Otherwise known as the *t*-statistics of coefficient of the regression, it adapts itself to the three processes similar to the DF.

A no constant and no trend series – Random walk process

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{k} \beta t \Delta Y_{t-1} + \varepsilon_t \quad [3.29]$$

With constant and no trend

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \sum_{i=1}^{k} \beta t \Delta Y_{t-1} + \varepsilon_t \quad [3.30]$$

With constant and with trend

$$\Delta Y_t = \alpha + \lambda t + \gamma Y_{t-1} + \sum_{i=1}^{k} \beta t \Delta Y_{t-1} + \varepsilon_t \quad [3.31]$$

In this study, unit root is tested for using Dickey and Fuller's (1979) ADF model given in Equation [3.31].

3.6.3.2 Optimal Lag Selection

The importance of lag length selection as a prerequisite for the estimation of ARDL model cannot be overemphasized. As a variant of the least squares regression approach, focus on lag length selection is both on the dependent and independent variables. The various lag length methods from which selection is made are Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Log-likelihood ratio (LR), and Hannan-Quinn Information Criterion (HQ).

Optimal lag length is required to avoid likely estimation errors that inappropriate lag length is bound to cause. An immediate implication of having quite a number of lags is the reduction in the power of the test due to loss of degrees of freedom. Besides, too many numbers of lags could lead to multiple estimation outcomes for the parameters. Conversely,

when lags are few, it may result in failure to capture the dynamics of the actual error correction process leading to poor results.

In this study, the optimal lag is determined using the AIC. It has been argued that the AIC perform better particularly where the sample size is small (Abdullahi, 2016). The AIC model is as given in Equation [3.32]

$$AIC_p = \frac{-nm}{2}(1 + log2\pi) - \frac{n}{2}\, log\left|\hbar_p\right| - ms \qquad [3.32]$$

where *p* represents the maximum order of VAR to be selected in the model, *n* is the sample size, *m* is the number of parameters in the model, $\hbar_0$ is the regression estimator of the covariance matrix, and $\hbar_p$is the maximum log-likelihood function.

3.6.3.3 The Optimal Model

To determine the optimal ARDL model, both the dependent and independent variables are combined in a single equation form as given by Equation [3.22]. Each of the variables in the model is entered based on the number of the chosen lags using any of the information criteria such as AIC, FPE, SBC, and HQ.

According to Pesaran (2001), the optimal model estimates the influence of the regressors on the regressand with a view to determining the relationship among the variables using the probability value, R^2, probability (*F*-Statistic), and Durbin-Watson statistic. The estimation is carried out using the OLS regression.

3.6.3.4 Bounds Test for Cointegration

The bound cointegration test of variables in the model in Equation [3.14] is carried out using the ARDL method as developed by Pesaran et al. (2001) using the model in Equation [3.33]

$$\Delta lny_{it} = \delta_0 + \sum_{i=1}^{n} \delta_i \Delta lny_{i,t-1} + \sum_{j=1}^{p} \gamma_j lny_{i,t-1} + \varepsilon_{it} \quad [3.33]$$

where *lny* is the vector of endogenous variables earlier defined as stock returns and its associated risk factors, i = 1, 2, …, n, j = 1, 2, …, p, as shown in Equation [3.12]. The symbol Δ is the difference operator. Using *F*-statistics, the long run relationship is determined by testing the significance of the variables at lagged levels. The null hypothesis H_0: $y_1 = y_2 = \dots y_5 = 0$ is used to test the joint significance of the model.

The critical values advanced by Pesaran et al. (2001) include purely level variables I(0), purely differenced variables I(1), and mutually cointegrated variables. By implication therefore, ARDL model is appropriate regardless of whether the underlying regressors are purely I(0), purely I(1), or mutually cointegrated (Marashdeh, 2005). With the *F*-statistics value obtained, and comparing same with the two set of upper and lower bounds critical values tabulated by Narayan (2005), the null hypothesis of no cointegration is tested against the alternative. The two set of critical values I(0) and I(1) represent the lower bound and upper bound, respectively. The null hypothesis of no cointegration is rejected in preference for the alternative when the calculated *F*-statistic is found to exceed the upper bound. Conversely, should the *F*-statistic fall below the lower bound, the null hypothesis of no cointegration among the variables cannot be rejected. However, if the *F*-statistic lies

between the lower and upper bounds, the result becomes inconclusive. To make inference, the order of integration of variables must be known.

Upon the establishment of a cointegrating relationship among the variables of interest, Equation [3.12] is estimated. To do so, it is specified in the form given in Equation [3.34]

$$\begin{aligned}\Delta \ln STR_t \;= \alpha_0 + \sum_{i=1}^{k} \alpha_i \Delta lnSTR_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta lnEXRVL_{t-1} + \\ \sum_{i=1}^{k} \alpha_i \Delta lnINTRVR_{t-1} \quad + \sum_{i=1}^{k} \alpha_i \Delta lnMS_{t-1} + \\ \sum_{i=1}^{k} \alpha_i \Delta lnINFR_{t-1} + \delta_1 lnSTR_{t-1} + \delta_2 lnEXRVL_{t-1} + \\ \delta_3 lnINTRVR_{t-1} + \delta_4 lnMS_{t-1} + \delta_5 lnINFR_{t-1} \qquad [3.34]\end{aligned}$$

where δ is the coefficient of the variables and the null hypothesis of H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5$ implies a no cointegration among variables. Conversely, the alternative hypothesis H_0: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$ implies the presence of cointegration among variables. When cointegration is found, the long run model is estimated.

3.6.3.5 Long Run Estimation

When variables are cointegrated, it becomes necessary to estimate the cointegrating vectors i.e. the long run equilibrium relationship among the cointegrating variables. The estimates of the elasticities of the models are determined based on the ARDL results. In its general form, Equation [3.35] is employed for this purpose.

$$\boldsymbol{lnSTR_{it} = \gamma_0 + \sum_{i=1}^{n} \gamma_j \Delta lnSTR_{it-i} \varepsilon_t} \; ; \; i = 1, 2, \ldots, 5 \text{ and } j = 1, 2, \ldots, 5 \qquad [3.35]$$

Using the variables of this study, and specifying the model in disaggregated form, the transformed Equation [3.35] takes the form as presented in Equation [3.36]

$$lnSTR_t = \alpha_1 + \sum_{i=1}^{k} \beta_{1i} lnSTR_{t-i} + \sum_{i=1}^{k} \delta_{1i} lnERV_{t-1} + \sum_{i=1}^{k} \gamma_{1i} lnIRV_{t-1} + \sum_{i=1}^{k} \varphi_{1i} lnMYS_{t-1} + \sum_{i=1}^{k} \vartheta_{1i} lnINR_{t-1} + \varepsilon_{1t} \quad [3.36]$$

3.6.3.6 Short Run Estimation

The estimation of short run relationship using the ARDL approach is simply the reparamerisation of the error correction model (ECM). The reparameterised result encompasses both the short run dynamics and the long run representation (Nkoro & Uko, 2016). The long run representation in the short run model is given by the ECM_t. It is generated from the residual of the long run estimation. The short run model for this study therefore is as presented in Equation [3.37]

$$\Delta lnSTR_t = \alpha_1 + \sum_{i=1}^{k} \beta_{1i} \Delta lnSTR_{t-i} + \sum_{i=1}^{k} \delta_{1i} \Delta lnERV_{t-1} + \sum_{i=1}^{k} \gamma_{1i} \Delta lnIRV_{t-1} + \sum_{i=1}^{k} \varphi_{1i} \Delta lnMYS_{t-1} + \sum_{i=1}^{k} \vartheta_{1i} \Delta lnINR_{t-1} + \lambda ECT_{it-1} + \varepsilon_{1t} \quad [3.37]$$

Since the short run estimation explains how the model instantaneously converges to equilibrium, it is a measure that seeks to determine the speed of adjustment when disequilibrium occurs. The model simply indicates that the change in stock returns is due to the current change in the independent variables plus an error correction term (*ECT*). The speed of adjustment and effectiveness of the feedback is measured by the lag error

correction term (ECT_{i-1}). In other words, this describes the instantaneous convergence to equilibrium after a shock in the system. The coefficient of the lagged *ECT* should be less than one and statistically significant to ensure an adjustment of disequilibrium in the model. A higher ECT_{it-1} coefficient ensures a faster speed of adjustment.

3.6.3.7 Diagnostic Checking

Diagnostic checking is conducted to confirm the goodness of fit of the ARDL model. The check basically investigates the functional normality as well as the stability of the model. Both the cumulative sum of recursive residual and the sum of squares of the same recursive residuals are also used in validating the RESET test of the ARDL model stability. The model is considered fit if only but a very small difference is noted between the forecast and real observations.

3.7 Conclusion

The presentation of the methodology for this study has been explicitly given in this chapter. Each step is geared towards attaining the study objectives using time series analysis. The methods of analysis include descriptive statistics, EGARCH, and ARDL. As a necessary precondition, unit root test was conducted before the estimation of ARDL model. It is included to ensure no variable is I(2) to avoid crashing the model and making the estimation result a fruitless effort.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses results of analysis carried out on empirical data used for the study. It is divided into five sections beginning with this introduction. Section 4.2 presents a descriptive analysis of each bank's stock returns as well as a comparison of the returns of the banking sector with that of the industrial sector and ASI. Descriptive statistics of the ASI, the banking sector, as well as the industrial sector is also presented in this section. Section 4.3 estimates and discusses the volatility of exchange rate – how current exchange rate volatility affects the conditional volatility in the periods ahead. Section 4.4 presents the cointegration analysis results and section 4.5 concludes the chapter.

4.2 Descriptive Analysis of Banks' Stock Returns

4.2.1 Comparison of Commercial Banks' Returns Characteristics

This section provides presents estimates of the descriptive statistical analysis of the stock returns of fifteen banks for which data are available across the study period. The returns are computed on an annual basis for each of the banks. It is with the view to answer objective one of the study. It focuses on comparison among all banks whose shares are quoted on NSE and also includes a comparison of the banking sector returns with the returns from the industrial sector and the ASI.

In 2010 being the first year of the study, all banks recorded positive returns except three banks which include Keystone, UBA, and Union each of which had negative returns.

However, as shown in Table 4.1, Diamond, FBN, FCMB, Fidelity, Sterling, and Wema recorded returns that were less than one percent. The highest return for that year was for Zenith, followed by Access, Polaris, Stambic/IBTC, and Guaranty in that order. The situation however went gloomy in 2011 as all banks except Guaranty reported negative returns.

Table 4.1
Returns per Annum (percent), 2010 - 2017

Bank	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Average**
Access	2.88	-4.08	3.87	1.25	-2.04	-3.05	0.88	4.09	0.475
Diamond	0.71	-4.68	1.14	2.85	-0.73	-3.58	-1.50	0.21	-0.697
Eco	1.04	-4.86	1.01	3.27	2.82	-0.87	-6.50	7.47	0.422
FBN	0.45	-3.11	5.05	0.86	-5.51	-4.06	-1.93	3.88	-0.546
FCMB	0.60	-3.04	-0.32	0.22	-0.09	-1.42	-0.89	0.07	-0.608
Fidelity	0.07	-1.17	0.71	0.58	-1.10	-0.24	-0.59	0.91	-0.103
Guaranty	2.52	1.94	5.37	7.75	-2.50	-0.40	0.51	20.49	4.010
Keystone	-0.15	-1.30	0.00	0.00	0.00	0.00	0.00	0.00	-0.181
Polaris	2.82	-3.67	-0.34	0.10	-1.37	-0.77	-1.20	-0.02	-0.556
Stambic/IBTC	2.78	-2.51	-0.54	6.59	9.40	-11.50	-2.85	27.34	3.588
Sterling	0.86	-1.00	0.39	0.80	0.04	-0.39	-1.28	0.29	-0.036
UBA	-0.59	-4.23	2.05	3.01	-2.41	-1.10	0.56	5.60	0.361
Union	-5.97	-10.65	-3.25	2.10	-1.95	-2.26	-1.46	1.87	-2.696
Wema	0.33	-0.90	-0.03	0.74	-0.24	-0.04	-0.44	-0.02	-0.075
Zenith	3.94	-3.43	5.49	4.22	-0.37	-5.24	-1.81	11.19	1.748
Total	12.29	12.29	20.60	34.34	-6.05	-38.52	-18.50	83.37	5.105

By 2012, all the banks showed upward movement in their returns even though a few had negative returns. This upward movement in stock returns continued for most banks in 2013

even though a few recorded marginal decrease in the returns. An interesting aspect of the year 2013 is that no bank recorded negative returns. This may have resulted from the CBN's effort at boosting the economy through its monetary policy measures. Additionally, it is the year with the highest return in aggregate terms.

Beyond 2013, specifically in 2014, all banks except Eco, Keystone, Stambic/IBTC, and Sterling reported negative returns. While the returns for Keystone had stagnated since 2012, many of the other banks' returns had taken the downward turn. That trend continued into year 2015 where records of negative returns were without any exception. That year was the worse year in terms of aggregate returns for the banking sector. The situation may have resulted from the fall in global oil price which began in 2014 and worsening in 2015 until the economy plunged into recession in 2016. However, by 2017, all except Polaris and Wema reported positive and significant returns. Guaranty, Stanbic/IBTC, and Zenith reported extra-ordinary double-digit returns for this year. This upward turn of event for this year may have resulted from the CBN's monetary policy measures including the variation in monetary policy rate (MPC) as well as government's stabilization measures in the foreign exchange market.

On average, only three banks showed positive returns of rate greater than one percent for the study period. They are Guaranty, Stambic/IBTC, and Zenith. None of these banks is able to reach the aggregate average returns of 5.105 for the study period. The least average return is reported for Union bank.

A comparative analysis of results of the banking sector returns with that of the industrial sector as presented in Table 4.2 shows that the industrial sector returns was almost twice the banking sector returns in 2010. The lead by the industrial sector has been the outlook for most part of the study period except for 2012 when the banking sector led the industrial sector. The trend in negative returns which was first witnessed in 2011 in both sectors was resumed in 2014 and continued until 2016. This is suggestive of the negative impact of revenue shortfall arising from the fall in global oil prices within that period. However, the positive returns that were restored in 2017 may have resulted from the marginal rise in the price of oil as well as the positive outcome of the CBN's monetary policy initiatives. Interestingly, returns for 2017 were the highest for both sectors.

Table 4.2
Annual Percentage Returns for Banking Sector, Industrial Sector, and ASI, 2010 - 2017

Year	Banking Sector Returns (%)	Industrial Sector Returns (%)	Returns for ASI (%)
2010	17.03	32.70	16.44
2011	-35.33	-17.60	-22.74
2012	31.50	24.62	29.49
2013	26.59	47.62	38.46
2014	-10.73	-08.81	-11.93
2015	-33.62	-11.60	-23.22
2016	-13.55	-09.34	-08.15
2017	66.29	43.62	40.76

Returns for the ASI are a reflection of happenings in the various sectors of the economy. Considered as average returns, they generally follow similar pattern with those of the sectors they represent.

4.2.2 Descriptive Statistics

This section presents the descriptive statistics of the banking and industrial sectors' indices as well as the ASI of the NSE. The results as presented in Table 4.3 make a comparison specifically between the banking sector indexes and the industrial sector indexes. The mean value for the industrial sector is higher than the mean value of the banking sector by about a half of the banking sector value. On average, the banking sector returns have exhibited low tendencies in its return volatility. This is evident by its standard deviation value which is far lower than that of the industrial sector. However, for both categories of indices, the standard deviation which is the measure of dispersion in the returns series are lower than the mean values, an indication of a narrow difference between the minimum value and maximum value of the returns during the study period.

Table 4.3
Descriptive Statistics of Selected Indices on the NSE

	ASI	Banks	Industry
Mean	29385.61	131.60	210.08
Median	27596.82	131.39	212.62
Maximum	42664.95	177.65	323.81
Minimum	20012.13	84.32	109.22
Std. Dev.	6158.16	27.87	57.11
Obs	95	95	95

Note: ASI is All Share Index, Bank is banking sector index, and Industry is industrial sector index

4.3 Volatility Analysis of Exchange Rate

This section focuses on the determination of the relationship between exchange rate volatility and its conditional volatility beyond 2016 with a view to answering objective two of the study. Particular attention is on ARCH effect and the result of EGARCH estimation of Equation [3.21]. The section begins from sub-section 4.3.1 through to subsection 4.3.3.

4.3.1 ARCH Effect Test Results

Following an AR (1) test conducted on the data, a serial correlation test was also conducted on the residual of the result. The test of the ARCH effect results presented in Table 4.4 show a significant ARCH effect statistic of 8.215 at five percent level of significance; hence the null hypothesis of no ARCH effect is rejected. The implication therefore is that the GARCH estimation is appropriate to be conducted on the data.

Table 4.4
Heteroscedasticity Test Results: ARCH

***F*-statistic**	**Obs x R-squared**	**Prob. F (1, 92)**	**Prob. χ^2 (1)**
8.811	8.215	0.004*	0.004*

Note: * denotes significant at five percent level of significance

4.3.2 EGARCH Estimation Results

The EGARCH estimation whose results are represented in Table 4.5 follows the confirmation of model adequacy through ARCH effect test. The results show a positive and significant mean equation at five percent level of significance. Additionally, information on the exchange rate volatility, measured by the squared residual indicates that there exist a negative and statistically significance result at five percent level of significance. However, the GARCH term is positive and significance at five percent level. With the sum of squared error and conditional variance coefficient (0.998) approximating unity, it is suggestive of volatility clustering with a highly persistent volatility shock.

The positive and statistically significant *z*-statistic of the GARCH term result, gives the indication of a positive relationship between ERV and its conditional volatility in periods ahead. With a negative coefficient for the ARCH term which is also statistically

significance, the result suggests that good news has a larger effect on volatility than bad news. This means that ERV has a negative impact on conditional volatility in periods ahead. Meanwhile, the mean equation estimates indicate persistence of volatility clustering meaning that period of large (small) volatility is followed by another period of large (small) volatility.

Table 4.5
EGARCH Test Result

Variable	Coefficient	Std. Error	*z*-Statistic	Prob
C	0.469	0.158	2.975	0.002*
AR (-1)	0.998	4.64E-05	21486.060	0.000*
	Variance	Equation		
C	0.716	0.159	4.518	0.000*
RESID(-1)^2	-1.015	0.215	-4.719	0.000*
GARCH(-1)	1.468	0.234	6.287	0.000*
EGARCH(-1)	0.812	0.036	22.467	0.000*

Note: * denotes significant at five percent level of significance

The findings of this study confirm the pattern of exchange rate volatility in Nigeria since floating or flexible exchange rate was adopted. Previous experience has shown that volatility in one period has led to volatility in another period be it either positively or negatively (Bala & Asemota, 2013). Additionally, Al-Abri (2013) and Grossmann, Love, and Alexei (2014) in their separate studies are unanimous in their submission that conditional future volatility is caused by volatility of exchange rate in the current period, though they admitted that the magnitude of such influence varies across countries. The position of these authors was corroborated by Aliyu et al. (2013) who maintained that for both developing and developed economies *ERV* strongly influence its conditional volatility.

4.3.3 Analysis of Conditional Standard Deviation

Figure 4.1 shows the conditional standard deviation graph plotted with the data used for the analysis. The plot reflects the clustering in the exchange rate series as mentioned earlier where periods of high volatility is followed by a relatively stable periods of low volatility.

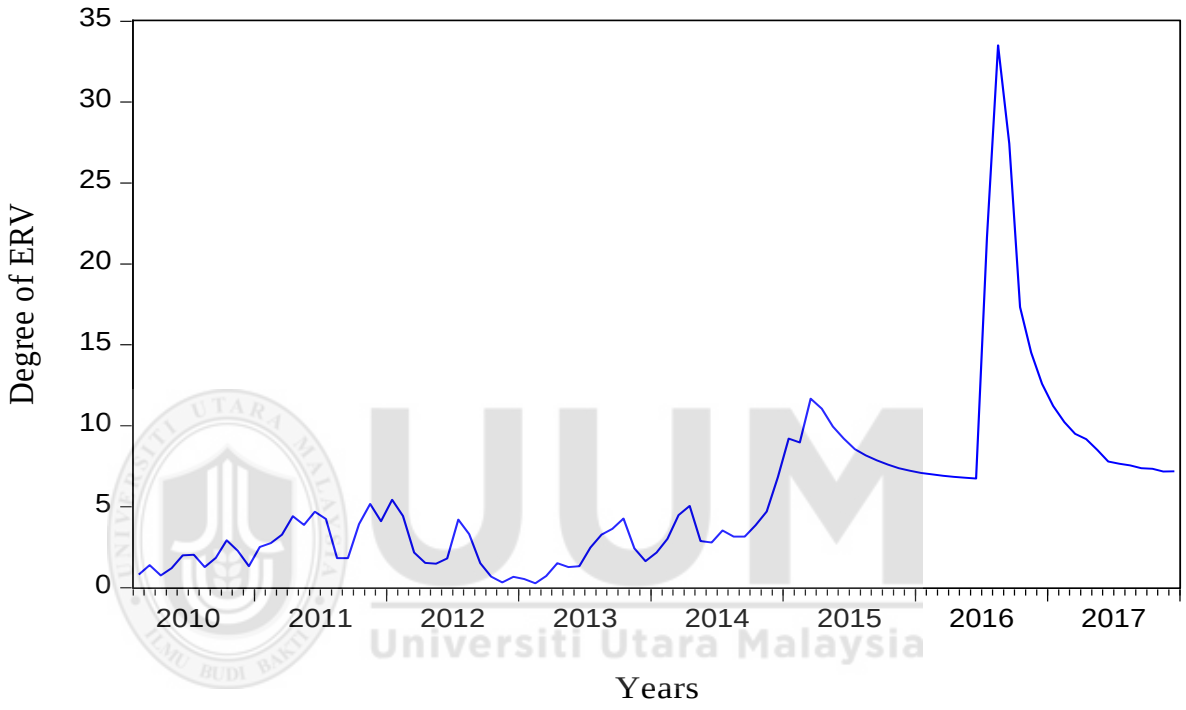

Figure 4.1
Conditional Standard Deviation

Between 2010 and 2014, volatility of the exchange rate was mild. The volatility level was below five degrees. However, beyond 2014, it climbed to a level beyond ten degrees before falling to about six degrees in 2016. Beyond that moment, an astronomical rise was witnessed reaching about thirty-four degrees before falling again to about seven degrees in 2017. The highest level of exchange rate volatility recorded in the year 2016 was as a result of total devaluation of ₦ by the monetary authorities. Sign of an intense pressure on the exchange rate began to show in the years preceding 2016 i.e. 2014 to 2015. Within this

period, the revenue derivable from sale of crude oil, Nigeria's largest source of revenue earning had begun to dwindle due to fall in the international price of crude oil. However, the pressure was curtailed due to government constant intervention through sales of foreign exchange to meet the demand of buyers in the foreign exchange market. But by 2016, owing to government's inability to sustain its interventionist stance, the volatility skyrocketed to a level never witnessed before in the history of exchange rate in Nigeria.

Previous findings as reported in literature by scholars have attested to the existence of oil price-exchange rate relationship. This is dependent on whether the country is an oil exporting or importing country. An oil exporting country will experience an appreciation when oil prices are rising while the importing country experiences depreciation in its currency exchange rate. The reverse is true when oil prices fall (Lizardo & Mollick, 2010). Specifically, Iwayemi and Fowowe (2011) found that a negative oil shock significantly caused the volatility of real exchange rate in Nigeria.

The combination of results from the ARCH effect test, EGARCH, as well as the conditional standard deviation test, led to the conclusion that exchange rate volatility in Nigeria between the period 2010 and 2017 experienced sustained volatility. This sustained volatility shocks in the ₦/USD rate, however, as the findings indicate, varies in its degree. The relative stability in volatility between 2010 and 2014 attests to the effectiveness of monetary policy of government in curtailing excessive and high volatility. That volatility of the exchange rate went so high in 2016 as a result of complete deregulation, attests to the huge success of the monetary policy measure in the preceding years.

4.4 Stock Returns, Exchange Rate Volatility and Interest Rate Variability

Results the addresses objective three of the study is presented in this section. Here, discussion is focused on results from the investigation carried out on the influence of exchange rate volatility and interest rate variability on stock return of commercial banks in Nigerian using the ARDL model. The results are based on the estimation of Equation [3.10]. Money supply and inflation rate are included as control variables. The sequence of the results is from sub-section 4.4.1 through to sub-section 4.4.9

4.4.1 Descriptive Statistics

The degree of confidence and reliability of data is the subject of discussion in this section. The results of the analysis carried out are as presented in Table 4.6. *STR* shows a mean result that is considerably lower than the standard deviation which measures dispersion in a series. This is attributed to the difference between the minimum value and maximum value of the *STR* series. This is indicative of the existence of some sort of instability in the series for which the group can be held responsible.

Table 4.6
Descriptive Statistic Result

Variable	Mean	Standard Deviation	Minimum	Maximum
STR	0.009	0.077	-0.153	0.253
ERV	4592.426	8983.677	0.013	25273.780
IRV	13.028	9.555	0.770	46.580
MYS	0.009	0.029	-0.050	0.134
INR	11.799	3.322	0.700	18.720

The standard deviation is reflective of the gap between the maximum value and minimum value of *STR* and it is likely to grow wider as the range between the two bounds grows wider. The implication of this is that the *STR* variable will continue to respond to the

vagaries of the macroeconomic variables and the interactions within the system hence resulting in its exhibiting the random walk process.

The *ERV* series show a higher mean value than its standard deviation value. Though a very wide gap existed between the minimum value and maximum value of this series, it does not seem to account for volatility of the exchange rate as argued by Ahmed (2016). The result is rather indicative of a series that is not so volatile. On the other hand, this series exhibited a relatively stable pattern except for a handful of large deviations at intervals caused by shocks such as the financial meltdown of 2008-2009 and that of 2014-2016 due to the sustained fall in the international price of crude oil which subsequently plunged the economy into recession.

Conversely, *IRV*, like *ERV*, has a standard deviation value that falls below the mean value, a situation which is indicative of the wide gap between the minimum value and the maximum value. This portrays a case of high variability in interest rate. It is reflective of the frequency with which the monetary authorities in Nigeria resort to the use of the interest rate as a monetary policy tool to stabilise the economy during periods of shock such as the ones presented by the fall in the value of exchange rate at different points in time.

4.4.2 Correlation Analysis

As a pre-estimation prerequisite, correlation analysis is essential to confirm the relationship between the dependent variable and independent variables based on theoretical specification and requirement.

Table 4.7
Correlation Matrix Result

Variables	*STR*	*ERV*	*IRV*	*MYS*	*INR*
STR	1.000				
	- -				
ERV	0.299	1.000			
	(0.003)	- -			
IRV	0.168	0.481	1.000		
	(0.105)	(0.000)	- -		
MYS	0.064	-0.075	-0.037	1.000	
	(0.541)	(0.470)	(0.725)	- -	
INR	-0.048	0.750	0.321	-0.024	1.000
	(0.645)	(0.000)	(0.002)	(0.820)	- -

Note: Figures in parentheses are probability values (*p*-values)

In this study, as can be seen from the correlation analysis results presented in Table 4.7, the association between the dependent variable and independent variables is relatively strong. The conclusion arrived at from the results is that while the correlation between *STR* and *ERV* is strong and statistically significant with a probability value below five percent, the correlation between *STR* and *IRV* is relatively weak and statistically insignificant with a probability value slightly exceeding 10 percent significant level.

4.4.3 Unit Root Test

Each of the variables in this study was observed as having different pattern when the data were plotted. Consequently, based on each data's unique time plot, the unit root test was carried out. The results of the tests as contained in Table 4.8 show that only *MYS* variable is stationary at level. All the other variables including *STR*, *ERV*, *IRV* and *INR* are stationary only after first difference. The unit root test is carried out using all the estimation categories of intercept, intercept and trend, as well as no intercept, no trend.

Table 4.8
Unit Root Test Result

Variables	Level		First Difference	
	t-stat	Probability	*t*-stat	Probability
Intercept				
STR	-7.753	0.000*	-6.996	0.000*
ERV	-0.083	0.947	-7.052	0.000*
IRV	-2.682	0.081	-5.062	0.000*
MYS	-9.790	0.000*	-5.888	0.000*
INR	-1.492	0.534	-4.894	0.000*
Intercept and Trend				
STR	-7.771	0.000*	-6.458	0.000*
ERV	-1.358	0.867	-7.204	0.000*
IRV	-3.316	0.070	-5.020	0.001*
MYS	-9.720	0.000*	-5.819	0.000*
INR	-1.922	0.635	-5.054	0.000*
None				
STR	-7.733	0.000*	-7.036	0.000*
ERV	0.025	0.803	-6.937	0.000*
IRV	-0.561	0.471	-4.981	0.000*
MYS	-8.933	0.000*	-5.936	0.000*
INR	-0.386	0.543	-4.921	0.000*

Note: * denotes significant at five percent level of significance

Given the mix of I(0) and I(1) variables following the unit root test, and in line with Pesaran (2001), the ARDL model is adopted for both the long and short run cointegration estimation.

4.4.4 ARDL Lag Length Selection

The VAR lag length selection result is a precursor to the subsequent estimation of the ARDL model. The model is estimated using lag two which is the optimal lag length selected by all the criteria. It should be noted that decision is based on FPE and AIC criteria considering that they are reputed to produce the least probability among all other criteria (Liew, 2004). The lag length result is given in Table 4.9.

Table 4.9
VAR Lag Length Selection Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-833.094	NA	10960853	19.048	19.188	19.104
1	-759.580	137.004*	2109324	17.400	17.569*	17.468*
2	-758.511	1.967	2106299*	17.398*	17.560	17.477
3	-758.436	0.137	2151400	17.419	17.419	17.510

Note: Lag order selected by the criterion is indicated by *. LR is sequential modified LM test statistic (each test at 5% level), FPE is Final Predictor Error, AIC is Akaike Information Criterion, SC is Schwarz Information Criterion, and HQ is Hannan-Quinn Information Criterion.

4.4.5 Optimal Model

In this section, optimal ARDL model is selected for the purpose of estimation. Following Pesaran (2001), the optimal model generated to analyse the impact of *ERV* and *IRV* on *STR* ss depicted in Table 4.10 is model (2,0,0,0,0). Using this optimal ARDL level order, the relationship between the estimated variables can be determined.

Table 4.10
ARDL Optimal Model

Variable	Coefficient	Standard Error	*t*-statistic	Prob.
STR(-1)	1.178	0.107	10.996	0.000*
STR(-2)	-0.169	0.117	-1.439	0.154
ERV	0.079	0.029	2.761	0.007*
IRV	-40.412	16.938	-2.386	0.019*
MYS	-4818.495	4967.091	-0.970	0.335
INR	-60.718	74.390	-0.816	0.417
C	1077.883	860.250	1.253	0.214

R-squared	0.867	Mean dependent var	2341.648
Adjusted R-squared	0.858	S.D. dependent var	3585.545
S.E. of regression	1352.036	Akaike info criterion	17.328
Sum squared resid	1.59E-08	Schwarz criterion	17.518
Log likehood	-807.424	Hannan-Quinn criter.	17.405
F statistic	94.510	Durbin-Watson stat	1.987
Prob. (F-statistic)	0.000		

Note: * denotes significant at five percent level of significance

4.4.6 ARDL Bound Test

The aim of the ARDL bound test is to establish the existence of a cointegration relationship between and among variables as earlier discussed in Section 3.6.2.4. Table 4.11 presents the results of the test.

Table 4.11
ARDL Bound Test Results

Variables	*F*-statistic	Lag	Sig. Level	Critical Value I(0)	Critical Value I(1)
F_{STR}(*STR, ERV, IRV, MYS, INR*)	5.94*	2	1%	5.15	6.36
F_{ERV}(*ERV, STR, IRV, MYS, INR*)	1.72	2	5%	3.79	4.85
F_{IRV}(*IRV, STR, ERV, MYS, INR*)	2.57	2	10%	3.17	4.14
F_{MYS}(*MYS, STR, ERV, IRV, INR*)	6.68*	2			
F_{INR}(*INR, STR, ERV, IRV, MYS*)	2.48	2			

Note: * denotes significant at five percent level of significance

The *F*-statistic bound test presented in Table 4.11 is based on the defined variables for Equation [3.11]. An *F*-statistic of 5.94 which is far above the upper bound at five percent level of significance indicates that the dependent variable *STR* proved to have a cointegrating relationship with *ERV, IRV, MYS*, and *INR*. However, additional estimation showed a similar situation showed that when *MYS* is the dependent variable, an *F*- statistic of 6.68 indicates a cointegrating relationship. With the other variables of *ERV, IRV*, and *INR* variously as dependent variables, their resulting *F*-statistics fall short of the lower bound critical values, indicating that there is no cointegrating relationship among them.

4.4.7 Long-run Relationship Estimation

Table 4.12 presents the long run estimation results for the cointegrated equation of *STR* as dependent variable and the two independent variables of *ERV* and *IRV*. Both of the independent variables reported statistically significant coefficients. But while *ERV* is at five percent level of significance, *IRV* is at 10 percent level of significance, indicating the existence of a relationship between each of the variables with *STR*. The relationship between *ERV* and *STR* is positive while that between *IRV* and *STR* is negative. The implication is that an increase in *ERV* results in an increase in *STR* while an increase in *IRV* decreases *STR.* This means that a one percent increase in *ERV* will result in 0.7 percent increase in *STR* while a one percent increase in *IRV* will result in a 2.03 percent decrease in *STR.*

Table 4.12
Long Run Coefficient Results

Variable	Coefficient	Standard Error	*t*-statistic	Prob.
LERV	0.733	0.090	8.105	0.000*
LIRV	-2.036	1.014	-1.956	0.054**
LMYS	-31.569	110.191	-0.287	0.775
LINR	-11.215	1.407	-7.970	0.000*
C	171.232	14.129	12.119	0.000*

Note: * denotes significant at five percent level of significance
** denotes significant at ten percent level of significance

Various studies that reported significant relationship between *ERV* and *STR* include Granger, Huangb, and Yang (2000), Elyasiani and Mansur (2003), Hahm (2004), Ratanapakorn and Sharma (2007), Hyde's (2007), Chkili and Nguyen (2014), as well as Meng and Deng (2015). Of particular note is the positive and significant relationship reported by Granger, Huangb, and Yang (2000) and Ratanapakorn and Sharma (2007). In

line with the result of this study regarding the relationship between *ERV* and *STR*, Maku and Atanda (2010) submit that *ERV* among other macroeconomic variables determine the *ASI* of the *NSE*.

On the other hand, in the long run, *IRV* portrays a negative relationship with *STR*. *IRV* coefficient of -2.036 is statistically significant at 10 percent. With a higher coefficient when compared to *ERV*, *IRV* proves to have greater influence on *STR* than *ERV*. The implication is that in the long run, *IRV* exacerbate *STR*. Elyasiani and Mansur (2004) and Ballester, Ferrer, and González (2010) in their submission agree that the relationship between *IRV* and *STR* is significant. However, while the former reported a differential impact, the later reported an emphatic negative relationship between them. Specifically, Priti (2016) found the variability spillover effect for both long-term and short-term interest rates for three U.S. bank portfolios. Other scholars who found negative and significant relationships between these macroeconomic variables are Jain, Narayan, and Thomson (2011) and Nurazi and Usman (2016).

4.4.8 Short-run Relationship Estimation

As presented in Table 4.13 the results from the stock returns model estimated for the short run period is aimed at capturing the long run dynamics of the model. As required, the estimated ECT_{t-1}reported a negative value and a probability value that is statistically significant at five percent significance level.

Table 4.13
Short run Elasticity Estimates

Variable	Coefficient	Standard Error	*t*-statistic	Prob.
D(STR(-1))	-0.504	0.101	-5.009	0.000*
D(STR(-2))	-0.215	0.100	-2.138	0.036*
D(ERV(-1))	-0.775	0.381	-2.032	0.046*
D(ERV(-2))	-0.873	0.378	-2.309	0.024*
D(IRV(-1))	-0.733	0.393	-1.864	0.066**
D(IRV(-2))	-0.817	0.412	-1.985	0.051**
D(MYS(-1))	0.339	0.198	1.713	0.090**
D(MYS(-2))	0.343	0.199	1.724	0.091**
D(INR(-1))	-0.012	0.006	-1.809	0.074**
D(INR(-2))	0.020	0.011	-0.415	0.679
C	-0.001	-0.008	-0.116	0.908
ECT_{t-1}	-0.692	0.133	-5.213	0.000*

Note: * denotes significance at five percent significant level
** denotes significance at 10 percent significant level

By implication, a significant ECT_{t-1} is an indication that a causal relations exist among *STR*, *ERV* and *IRV*. Also, an ECT_{t-1} coefficient of -0.692 indicates that the model has an adjustment rate of 69.2 percent from one period to another. This means that any change occasioned by any of the variables in the model, will be adjusted for by 69.2 percent at the end of the period (end of the month in this case).

It is important to note that the results in Table 4.13 show negative disequilibrium for all the variables of interest however, with divergent significant level. *STR* and *ERV* are both statistically significant at five percent while *IRV* is significant at 10 percent. Both *ERV* and *IRV* therefore by implication explain the innovation in *STR* though with *IRV* having a lesser degree of influence. Evidence of this can be seen in 2008 when stock prices plummeted as a result of the fall in exchange rate following the global melt down. The results further reveal that the coefficient of the lag of ERV is having negative signs, an indication that it is

inversely related to *STR*. On the other hand, the positive sign of the *IRV* coefficient indicates that the *STR* and *IRV* variables move in the same direction.

Kasman, Vardar, and Tunc (2011) submit that conditional bank stock return is majorly determined by interest rate and exchange rate volatility. Similar results were documented by Choi, Elyasiani, and Kopecky (1992). The scholars particularly found that exchange rate innovations were significantly negatively related to bank stock returns. Their finding has been confirmed by Adjasi, Harvey, and Agyapong (2008). As regards the result on interest rate, the finding of this study is in line with what was earlier reported by Elyasiani and Mansur (1998).

4.4.9 Diagnostic Checking

The need to validate results of the ARDL optimal model estimate cannot be overemphasized. This is a recommended requirement in any econometric time series analysis (Nelson and Plosser, 1982). Results of the two tests conducted including serial correlation and stability tests are presented in this section.

4.4.9.1 Serial Correlation Test

The presence of serial correlation is usually confirmed using the LM test. A test result that is significant is an indication of serial correlation in the selected model and among estimated variables, otherwise no serial correlation. Conversely, if the test result is insignificant, it means there is no serial correlation among estimated variables in the model, hence the ARDL optimal equation estimation result is acceptable. From the results obtained, as shown in Table 4.14, the LM result shows failure to reject null hypothesis, an indication that the residuals of the model are not serially correlated.

Table 4.14
Serial Correlation Test Results

F-statistic	Obs x R-squared	Prob. F(1, 85)	Prob. $\chi^2(1)$
0.726	0.787	0.397	0.375

From Table 4.14, an insignificant *F*-statistic probability value of the LM test shows that there is no serial correlation among the variables in the model.

4.4.9.2 Stability Test

The Ramsey RESET test of stability shown on Table 4.15 indicates that the stock returns and associated risk factors model contains parameters that are well distributed. The insignificant value obtained from the estimated result is an indication that over time, following any adjustment in variables arising from innovations in the short run, a long run relationship still exists among the variables.

Table 4.15
Stability Test Results

	Value	df	Probability
t-statistic	0.143	85	0.887
F-statistic	0.020	(1, 85)	0.887

Consequently, the graphical representation of the stability test result is given by the cumulative sum of recursive residual (CUSUM) and CUSUM-Q to validate the result of Ramsey REST test. It is held in literature that the application of the CUSUM as well as CUSUM-Q is confirmation of the constancy of long run parameters. The decision rule is that a CUSUM and CUSUM-Q that stays within a significance level of five percent is adjudged stable. The CUSUM and CUSUM-Q are depicted in Figure 4.1 and Figure 4.2, respectively. Both are within the significance level of five percent.

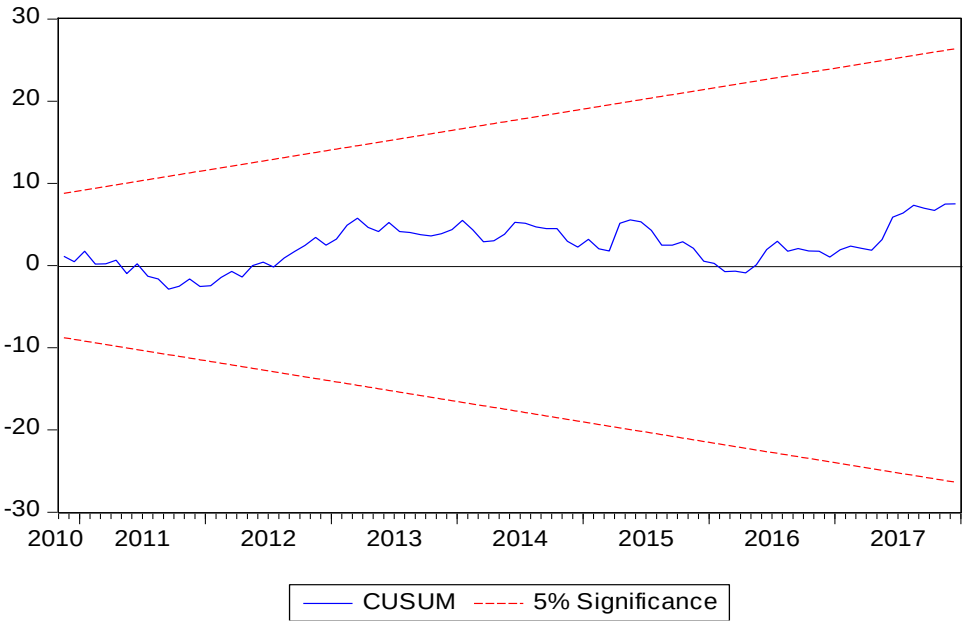

Figure 4.1
CUSUM at Five Percent Significance

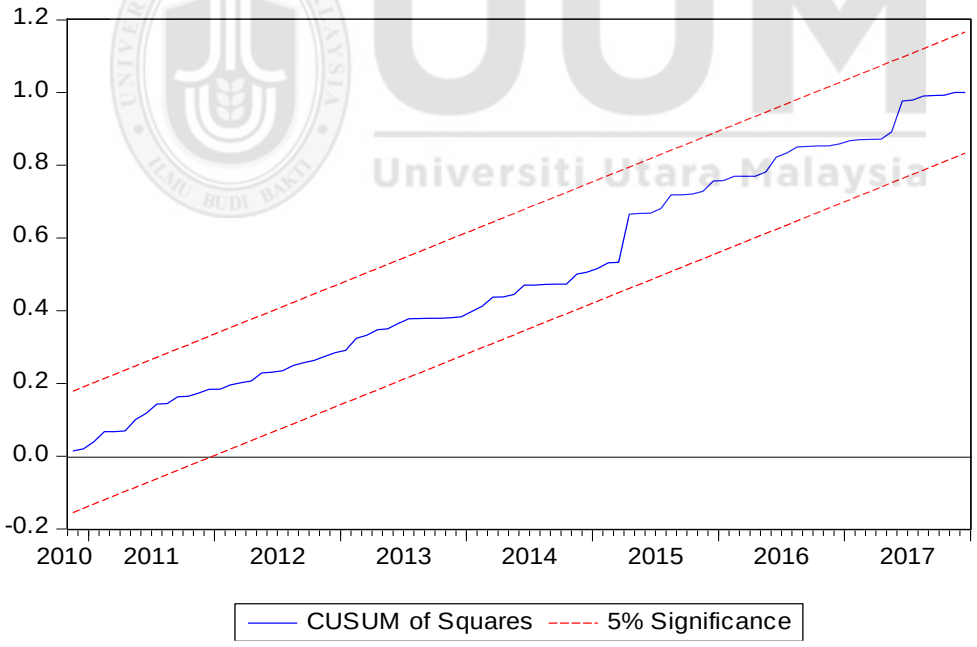

Figure 4.2
CUSUM of Squares at Five Percent Significance

4.5 Conclusion

In this chapter, the comparative descriptive statistics were presented to show the influence of the exchange rate volatility and interest rate variability on the indices. Results show that for most of the commercial banks, *ERV* is a significant determinant of *STR*. The ARCH, GARCH, and EGARCH estimation results were also presented to determine the conditional volatility of the exchange rate beyond 2016 in line with objective number two, and result shows that conditional *ERV* beyond 2016 is influenced by *ERV* in that year . Lastly, the estimation of the long run relationship among *STR, ERV* and *IRV* was carried out using the ARDL technique in line with the third objective, and it was found that *ERV* and *IRV* significantly determine *STR.*

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter sums up the entire study. Following this introduction is Section 5.2 which gives summary of findings. Section 5.3 advances the policy implication and recommendations regarding each of the findings. Section 5.4 features the limitation and suggestion for further study while the chapter concludes with Section 5.5.

5.2 Summary of Findings

The deregulation of exchange rate market following the adoption of SAP in 1986 may have been responsible for the fluctuations in exchange rates that have been witnessed thereafter. But while these fluctuations, particularly of the ₦/USD rate may have varied across time, the degree of its volatility in recent time leaves much to be desired. In the light of this development, the study, first and foremost investigated the effect of volatility of exchange rate on stock returns of commercial banks in Nigeria through a descriptive analysis of the returns between 2010 and 2017.

While objective one attempted a descriptive analysis with a view to understanding the impact of exchange rate fluctuations on commercial banks stock returns, objective two focused on a univariate study of the dynamics of exchange rate in the future period using its current volatility level. With a monthly data from 2010 to 2017 and using GARCH and EGARCH to analyse the data, the result show evidence of an overshooting volatility shock in ₦/USD exchange rate. This implies that much volatility was experienced during the

period under study. It confirms therefore that volatility of the present period is the cause of the volatility in the periods ahead.

Another aspect of the study is the influence of exchange rate volatility and interest rate variability on stock returns. To ascertain the extent of influence of the two explanatory variables on the dependent variable, the ARDL optimal model was used. The result indicates an adjustment rate of 69.2 percent in a subsequent month following any disequilibrium that occurs in a previous month. This implies that the volatility of exchange rate and variability of interest rate jointly impact stock returns of commercial banks in Nigeria. Precisely, the results show that interest rate variability is negatively related to stock returns in both the long run and short run, and at 10 percent level of significance. Exchange rate volatility however, is positively and negatively related to stock returns in the long run and short run respectively. Both relationships are at five percent level of significance.

5.3 Policy Implications and Recommendations

Results of the descriptive analysis of stock returns of commercial banks in Nigeria show different performance for each of the banks. In the years when exchange rates were fairly stable and with lesser variation in the interest rates, most banks report positive returns. The need for government through its monetary authorities to initiate measures that will ensure sustainable and stable exchange rates becomes necessary to prevent divestment which is what negative returns is likely to yield. Additionally, since volatility of exchange rate in Nigeria has been found to be a direct fall out of short fall from oil revenue whenever there is a fall in global oil price, the study recommends that government should deliberately build

and maintain its foreign reserve at a level that makes its interventionist measures in the foreign exchange market sustainable at all times.

Furthermore, complete revision of the rules and regulations guiding the operations of the foreign exchange market needs to be carried out periodically to check the activities of currency speculators whose only stock in trade is to deal in currency exchanges with a view to making abnormal profit at the expense of the economy. Failure to ensure effective regulation of the foreign exchange market will lead to loss of investors' confidence in bank stocks which as the study results indicate for most of the banks, their average returns fall far below the industrial average of 5.11 percent.

The creation of a positive response to a negative shock and vice versa as obtained from the EGARCH results underscores that between exchange rate volatility and its conditional volatility in other future periods in Nigeria, there exist some form of relationship. In the light of this evidence, it become pertinent to recommend that government should as a matter of policy necessity put in place measures that will ensure positive shock that will result in negative response. A decrease in the degree of exchange rate volatility is guaranteed by a negative response which invariably means an appreciation in domestic currency value. To ensure stability and subsequent appreciation in the value of the ₦ therefore, strict implementation of the rules and regulations guiding the foreign currency market should be adhered to, so as to forestall frivolous allocations and the possibility of funding the activities of round trippers in the currency market.

To reduce the pressure imposed on the exchange rate due to increased demand from buyers of foreign currency, the study further recommends that other avenues of bilateral trade be explored with Nigeria's trading partners which de-emphasises dependence on USD as a means of payment. That way the demand placed on the authorities as chief supplier of foreign currency in Nigeria will be drastically reduced. The recently signed agreement for currency swap between China and Nigeria is an initiative that holds great promise.

In addition, since it has been established by the study that short fall in revenue from oil has been at the base of most volatility experienced in time past, the study therefore recommends that government should consider as a matter of priority the diversification of its revenue sources. In this regard, non-oil export opportunities with the potential of huge revenue receipt should be exploited. This should be considered as complementary to the exchange rate management effort of the monetary authorizes considering the possibility such effort to fail as it did fail in 2016 resulting in the economy slipping into recession.

Inflation targeting monetary framework should also be emphasised by the monetary authorities. This is capable of providing the needed hedge that may lead to stability in exchange rate volatility. To achieve this therefore, efficient manipulation of interest rates as an instrument of monetary policy should be encouraged. This can be brought about in an environment where the autonomy, accountability, and transparency of the monetary authorities are guaranteed. An increased autonomy is considered a panacea that ensures the transparency and accountability of interest rate determination by the monetary authorities.

From the ARDL results on how stock returns is been affected by the combine influence of exchange rate volatility and interest rate variability, and arising from the summary as earlier highlighted, the study recommends that while it may be necessary to allow some level of exchange rate volatility due to its positive relationship to stock returns, the degree of such volatility should not be allowed to get out of control as doing so may be harmful to the economy as a whole. As a major supplier of foreign exchange in the country, government has the responsibility to be eternally watchful and be strategic in its involvement in the currency market to ensure that only desired outcomes are encouraged at all times. For the interest rate whose variation is negatively related to stock returns, the study recommends that government put in place measures that lead to periodic fall in interest rates in order to boost confidence of investors in the stock market. In this regard, government should pursue policies that lead to cost reduction in stock market investment. This will not only ensure the retention of existing investors, but will encourage the entrance of new ones into the market.

5.4 Limitation and Suggestion for Further Study

As with most studies that employed time series data, this study has faced the challenge of data limitation and accessibility. The challenge has affected both the bank specific micro data with which the analysis leading to the attainment of objective one was carried out as well as the macro data for the analysis of both objective two and three of the study. Specifically, only 15 of the 22 commercial banks whose data were available for the length of the chosen period were analysised. Besides, the chosen period has been solely determined by data availability which was jointly sourced. Future researchers in this area may consider exploring other avenues that grants access to data with a view to improving on the quality of data to be used.

5.5 Conclusion

The synopsis of the entire chapter is presented in this section. This includes summary of findings arising from the three objectives, policy implications and recommendations, as well as the limitation and further suggestion for future research in this area of study.

REFERENCES

Abdullahi, M. M. (2016). *External debt, debt overhang, crowding out effects and capital formation in Nigeria and South Africa* (Doctoral dissertation, Universiti Utara Malaysia).

Abraham, T. W. (2011). Stock market reaction to selected macroeconomic variables in the Nigerian economy. *CBN Journal of Applied Statistics*, *2*(1), 61-70.

Abugri, B. A. (2008). Empirical relationship between macroeconomic volatility and stock returns: Evidence from Latin American markets. *International Review of Financial Analysis, 17(2),* 396-410.

Adaramola, A. O. (2011). The impact of microeconomic indicators on stock prices in Nigeria. *Developing Country Studies,* 1(2), 1-14.

Adeniji, S., Obansa, S. A. J., & Okoroafor, D. (2018). Monetary policy shocks and stock market prices volatility in Nigeria. *Business and Economic Quarterly*, *3*, 3-26.

Adenuga, A. O. (2010). Stock market development indicators and economic growth in Nigeria (1990-2009): Empirical investigations. *Economic and Financial Review*, *48*(1), 33-70.

Adeyemi, B. (2011). Bank failure in Nigeria: A consequence of capital inadequacy, lack of transparency and non-performing loans. *Banks and Bank Systems*, *6(1),* 99-109.

Adjasi, C., Harvey, S., & Agyapong, D. (2008). Effect of exchange rate volatility on the Ghana Stock Exchange. *African Journal of Accounting, Economics, Finance and Banking Research, 3(3),* 28-47.

Agrawal, G., Srivastav, A. K., & Srivastava, A. (2010). A study of exchange rates movement and stock market volatility. *International Journal of Business and Management, 5(12),* 62-73.

Ahmed, S. I. (2016). *Exchange rate volatility, external shock, and capital inflows in Nigeria* (Doctoral dissertation, Universiti Utara Malaysia).

Al-Abri, A. (2013). Real exchange rate volatility, terms-of-trade shocks, and financial integration in primary-commodity exporting economies. *Economics Letters*, *120*(1), 126-129.

Alam, M., & Uddin, G. S. (2009). Relationship between interest rate and stock price: Empirical evidence from developed and developing countries. *International Journal of Business and Management*, *4(3),* 43-51.

Aliyu, S. U. R., Yakub, M. A. U., Sanni, G. K., & Duke, O. (2009). Exchange rate pass-through in Nigeria: Evidence from a vector error correction model. MPRA Working Paper No 25053, Available at https: // mpra.ub.uni-muenchen.de/25053/

Aliyu, S. U. (2012). Reactions of stock market to monetary policy shocks during the global financial crisis: The Nigerian case. *CBN Journal of Applied Statistics*, *3*(1), 17-41.

Amarasinghe, A. (2015). Dynamic relationship between interest rate and stock price: Empirical evidence from colombo stock exchange. *International Journal of Business and Social Science*, *6(4),* 92-97.

Amassoma, D., & Rukayat, S. G. (2014). The Role of Exchange Rate Volatility on the Nigerian Stock Market Performance. *Journal of Business & Economic Studies*, *20*(2), 31-46.

Amihud, Y., & Mendelson, H. (1987). Trading mechanisms and stock returns: An empirical investigation. *The Journal of Finance*, *42(3),* 533-553.

Amihud, Y., & Mendelson, H. (1991). Volatility, efficiency, and trading: Evidence from the Japanese stock market. *The Journal of Finance*, *46(5),* 1765-1789.

Antwi, S., Ebenezer, A. M. F. E., & Zhao, X. (2012). The effect of macroeconomic variables on stock prices in emerging stock market: Empirical evidence from Ghana. *International Journal of Social Sciences Tomorrow, 1(10),* 1-10.

Anyanwu, J. C. (1992). President Babangida's structural adjustment programme and inflation in Nigeria. *Journal of Social Development in Africa, 7(1),* 5-24.

Arize, A. C., Osang, T., & Slottje, D. J. (2000). Exchange-rate volatility and foreign trade: Evidence from thirteen LDC's. *Journal of Business & Economic Statistics, 18(1),* 10-17.

Asekome, M. O., & Agbonkhese, A. O. (2015). Macroeconomic variables, stock market bubble, meltdown and recovery: Evidence from Nigeria. *Journal of Finance and Ban Management, 3*(2), 25-34.

Ayadi, O. F., Adegbite, E. O., & Ayadi, F. S. (2008). Structural adjustment, financial sector development and economic prosperity in Nigeria. *International Research Journal of Finance and Economics, 15,* 318-331.

Aydemir, O., & Demirhan, E. (2009). The relationship between stock prices and exchange rates: Evidence from Turkey. *International Research Journal of Finance and Economics, 23(2),* 207-215.

Ayopo, B. A., Isola, L. A., & Olukayode, S. R. (2015). Monetary policy dynamics and the stock market movements: Empirical evidence from Nigeria. *Journal of Applied Economic Sciences, 10(8),* 1179-1188.

Babajide, A., Isola, L., & Somoye, R. O. (2016). Stock market response to economic growth and interest rate volatility: Evidence from Nigeria. *International Journal of Economics and Financial Issues, 6*(1), 354-360.

Bala, D. A., & Asemota, J. O. (2013). Exchange-rates volatility in Nigeria: Application of GARCH models with exogenous break. *CBN Journal of Applied Statistics, 4*(1), 89-116.

Baillie, R. T., & Bollerslev, T. (1992). Prediction in dynamic models with time-dependent conditional variances. *Journal of Econometrics, 52*(1-2), 91-113.

Ballester, L., Ferrer, R., & Gonález, C. (2010). Impact of interest rate risk on the Spanish banking sector. In *Mathematical and statistical methods for actuarial sciences and finance* (pp. 1-11). Springer, Milano.

Ballester, L., Ferrer, R., & González, C. (2011). Linear and nonlinear interest rate sensitivity of Spanish banks. *The Spanish Review of Financial Economics, 9(2),* 35-48.

Balvers, R. J., Stivers, A., & Lee-Chin, M. (2016). *Arbitrage pricing restrictions and the predictability of stock returns by statistical factor analysis.* Hamilton, Ontario: McMaster University

Bansal, R. (2007). Long-run risks and financial markets. *Federal Reserve Bank of St. Louis Review, 89(4),* 283-99.

Bansal, R., Khatchatrian, V., & Yaron, A. (2005). Interpretable asset markets? *European Economic Review, 49(3),* 531-560.

Bansal, R., & Shaliastovich, I. (2010). Confidence risk and asset prices. *American Economic Review,* 100*(2),* 537-41.

Bansal, R., & Yaron, A. (2004). Risks for the long run: A potential resolution of asset pricing puzzles. *The Journal of Finance, 59(4),* 1481-1509.

Baum, C. F., Caglayan, M., & Barkoulas, J. T. (2001). Exchange rate uncertainty and firm profitability. *Journal of Macroeconomics, 23(4),* 565-576.

Benaković, D., & Posedel, P. (2010). Do macroeconomic factors matter for stock returns? Evidence from estimating a multifactor model on the Croatian market. *Business Systems Research Journal: International Journal of the Society for Advancing Business & Information Technology (BIT), 1(1-2)*, 39-46.

Berument, H., Metin-Ozcan, K., & Neyapti, B. (2001). Modelling inflation uncertainty using EGARCH: An application to Turkey. *Federal Reserve Bank of Louis Review*, *66*, 15-26.

Bickel, P. J., & Lehmann, E. L. (2012). Descriptive statistics for nonparametric models I. Introduction. *In Selected Works of EL Lehmann (pp. 465-471). Springer, Boston, MA.*

Bilson, C. M., Brailsford, T. J., & Hooper, V. J. (2001). Selecting macroeconomic variables as explanatory factors of emerging stock market returns. *Pacific-Basin Finance Journal, 9(4)*, 401-426.

Bollerslev, T. (1986). Generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics*, *31*(3), 307-327.

Bollerslev, T. (1987). A conditionally heteroskedastic time series model for speculative prices and rates of return. *The Review of Economics and Statistics, 69(3),* 542-547.

Bollerslev, T., Chou, R. Y., & Kroner, K. F. (1992). ARCH modeling in finance: A review of the theory and empirical evidence. *Journal of Econometrics, 52*(1-2), 5-59.

Bredin, D., & Hyde, S. (2011). Investigating sources of unanticipated exposure in industry stock returns. *Journal of Banking & Finance*, *35*(5), 1128-1142.

Broda, C. (2004). Terms of trade and exchange rate regimes in developing countries. *Journal of International Economics, 63(1),* 31-58.

Brodsky, D. A. (1984). Fixed versus flexible exchange rates and the measurement of exchange rate instability. *Journal of International Economics, 16(3-4),* 295-306.

Brooks, C. (2008). RATS Handbook to accompany introductory econometrics for finance. Cambridge Books.

Campbell, J. Y., Lo, A. W., & MacKinlay, A. C. (1997). *The econometrics of financial markets* (Vol. 2, pp. 149-180). Princeton, NJ: Princeton University Press.

Central Bank of Nigeria: Money market indicators. Accessible on https://www.cbn.ng

Chen, C., Chen, D., & Chen, C. (2011). The uncertainty of interest rate and exchange rate on stock returns: A revisit to Japan and Taiwan.http://southwesternfinance.org/conf-2010/B10-1.

Chen, N. F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *Journal of Business*, 383-403.

Cheung, Y. W., & Wong, C. Y. P. (2000). A survey of market practitioners' views on exchange rate dynamics. *Journal of International Economics, 51(2),* 401-419.

Chkili, W., & Nguyen, D. K. (2014). Exchange rate movements and stock market returns in a regime-switching environment: Evidence for BRICS countries. *Research in International Business and Finance, 31*, 46-56.

Choi, J. J., Elyasiani, E., & Kopecky, K. J. (1992). The sensitivity of bank stock returns to market, interest and exchange rate risks. *Journal of Banking &Finance, 16(5),* 983-1004.

Chung, T., & Ariff, M. (2016). Money supply, banking liquidity and stock index returns: Evidence from four major capital markets. *Business and Economics Journal, 7*(3), 1-9.

Ćorić, B., & Pugh, G. (2010). The effects of exchange rate variability on international trade: A meta-regression analysis. *Applied Economics*, *42*(20), 2631-2644.

Diacogiamnis, G. P., Tsiritakis, E. D., & Manolas, G. A. (2001). Macroeconomic factors and stock returns in a changing economic framework: The case of the Athens stock exchange. *Managerial Finance, 27*(6), 23-41.

Dickey, D. A. (1976). Estimation and hypothesis testing in nonstationary time series. Retrospective Thesis and Dissertation. Iowa State University Capstones. 6267.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74(366a),* 427-431.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica: Journal of the Econometric Society*, 1057-1072.

Dominguez, K. M. (1993). *Does central bank intervention increase the volatility of foreign exchange rates?* (Working Paper No 4532). Cambridge: National Bureau of Economic Research.

Elton, E. J., & Gruber, M. J. (1997). Modern portfolio theory, 1950 to date. *Journal of Banking & Finance, 21(11-12),* 1743-1759.

Elyasiani, E., & Mansur, I. (1998). Sensitivity of the bank stock returns distribution to changes in the level and volatility of interest rate: A GARCH-M model. *Journal of Banking & Finance, 22(5),* 535-563.

Elyasiani, E., & Mansur, I. (2003). International spillover of risk and return among major banking institutions: A bivariate GARCH model. *Journal of Accounting, Auditing & Finance,* 18*(2),* 303-330.

Elyasiani, E., & Mansur, I. (2004). Bank stock return sensitivities to the long-term and short-term interest rates: A multivariate GARCH approach. *Managerial Finance*, 30*(9)*, 32-55.

Emenike Kalu, O., & Okwuchukwu, O. (2014). Stock market return volatility and macroeconomic variables in Nigeria. *International Journal of Empirical Finance*, *2*(2), 75-82.

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica: Journal of the Econometric Society*, 50*(4)*,987-1007.

Engle, R. (2001). GARCH 101: The use of ARCH/GARCH models in applied econometrics. *Journal of Economic Perspectives*, *15*(4), 157-168.

Engle, R. (2004). Risk and volatility: Econometric models and financial practice. *American Economic Review*, *94(3)*, 405-420.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica: Journal of the Econometric Society*, 251-276.

Fama, E. F. (1975). Short-term interest rates as predictors of inflation. *The American Economic Review*,*65(3)*, 269-282.

Ferrer, R., Bolós, V. J., & Benítez, R. (2016). Interest rate changes and stock returns: A European multi-country study with wavelets. *International Review of Economics & Finance*, 44, 1-12.

Fisher, I. (1930). *The theory of interest.* New York, NY: The Macmillan Company.

Flavin, M. A. (1983). Excess volatility in the financial markets: A reassessment of the empirical evidence. *Journal of Political Economy*, *91(6)*, 929-956.

Flood, R. P., & Rose, A. K. (1999). Understanding exchange rate volatility without the contrivance of macroeconomics. *The Economic Journal*, *109(459)*, 660-672.

Friedman, M. (1953). The case for flexible exchange rates. In *Essays in positive economics*(pp. 157-203). Chicago, Illinois: University of Chicago Press.

Gan, C., Lee, M., Yong, H. H. A., & Zhang, J. (2006). Macroeconomic variables and stock market interactions: New Zealand evidence. *Investment Management and Financial Innovations*, *3(4)*, 89-101.

Garber, P. M., & Svensson, L. E. (1995). The operation and collapse of fixed exchange rate regimes. *Handbook of International Economics*, *3*, 1865-1911.

Ghosh, A. R., Gulde, A. M., Ostry, J. D., & Wolf, H. C. (1997). *Does the nominal exchange rate regime matter?* (Working Paper No 5874). Cambridge: National Bureau of Economic Research.

Goolsbee, A. D., &Klenow, P. J. (2018). Internet rising, prices falling: Measuring inflation in a world of e-commerce. In *AEA Papers and Proceedings*, 108, (pp. 488-92).

Granger, C. W., Huangb, B. N., & Yang, C. W. (2000). A bivariate causality between stock prices and exchange rates: Evidence from recent Asianflu. *The Quarterly Review of Economics and Finance*, *40(3)*, 337-354.

Grossmann, A., Love, I., & Orlov, A. G. (2014). The dynamics of exchange rate volatility: A panel VAR approach. *Journal of International Financial Markets, Institutions and Money*, *33*, 1-27.

Gujarati, D., Porter, D., (2008). *Basic Econometrics.* New York, NY: The McGraw-Hill Companies.

Gupta, J., Chevalier, A., & Sayekt, F. (2001). The Causality between interest rate, exchange rate and stock price in emerging markets: The case of the Jakarta Stock Exchange. In *Fuzzy sets in management, economics and marketing* (pp. 145-163). Jakarta, Indonesia: World Scientific Publishing Company Ltd.

Hahm, J. H. (2004). Interest rate and exchange rate exposures of banking institutions in pre-crisis Korea. *Applied Economics, 36(13),* 1409-1419.

Hajilee, M., & Al Nasser, O. M. (2017). The impact of interest rate volatility on stock market development: Evidence from emerging markets. *The Journal of Developing Areas, 51(2),* 301-313.

Haugen, R. A., Talmor, E., & Torous, W. N. (1991). The effect of volatility changes on the level of stock prices and subsequent expected returns. *The Journal of Finance*, *46*(3), 985-1007.

Hess, P. J., & Lee, B. S. (1999). Stock returns and inflation with supply and demand disturbances. *The Review of Financial Studies*, *12*(5), 1203-1218.

Hsing, Y. (2011). The stock market and macroeconomic variables in a BRICS country and policy implications. *International Journal of Economics and Financial Issues, 1(1),* 12-18.

Hyde, S. (2007). The response of industry stock returns to market, exchange rate and interest rate risks. *Managerial Finance, 33(9),* 693-709.

Inegbedion, H. E. (2012). Macroeconomic determinants of stock price changes: Empirical evidence from Nigeria. *Indian Journal of Finance, 6*(2), 19-23.

Iwayemi, A., & Fowowe, B. (2011). Impact of oil price shocks on selected macroeconomic variables in Nigeria. *Energy Policy, 39*(2), 603-612.

Jain, A., Narayan, P. K., & Thomson, D. (2011). The relationship between exchange rates, interest rates and Australian bank returns. *Applied Economics Letters*, *18(10)*, 967-972.

Jaffe, J., & Westerfield, R. (1985). The week-end effect in common stock returns: The international evidence. *The Journal of Finance, 40(2)*, 433-454.

Jambotkar, M., & AnjanaRaju, G. (2018). Impact of macroeconomic variables on the selected Indian sectoral indices: An empirical analysis. *International Journal of Academic Research and Development*, *3(2)*, 450-456.

Jawaid, S. T., & Ul Haq, A. (2012). Effects of interest rate, exchange rate and their volatilities on stock prices: Evidence from banking industry of Pakistan. *Theoretical and Applied Economics*, *19(8)*, 153-166.

Jeanchutima, S., & Tangjitprom, N. (2015, January). Bank stock return sensitivity to interest rate changes in Thailand. Paper presented at International Business and Economy Conference (IBEC) Symposium, Bangkok, Thailand. https://ssrn.com/abstract=2550005.

Jiranyakul, K. (2016). Are Thai equity index returns sensitive to interest and exchange rate risks? (Working Paper No. 72175). Bangkok: Munich Personal RePEc Archive

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, *12*(2-3), 231-254.

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica: Journal of the Econometric Society*, *59(6)*, 1551-1580.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics, 52(2),* 169-210.

Jordaan, H., Grove, B., Jooste, A., & Alemu, Z. G. (2007). Measuring the price volatility of certain field crops in South Africa using the ARCH/GARCH approach. *Agrekon, 46*(3), 306-322.

Jorion, P. (1990). The exchange-rate exposure of US multinationals. *Journal of Business, 63(3),* 331-345.

Jorion, P. (1995). Predicting volatility in the foreign exchange market. *The Journal of Finance, 50(2),* 507-528.

Kalyanaraman, L., & Tuwajri, B. (2014). Macroeconomic forces and stock prices: Some empirical evidence from Saudi Arabia. *International Journal of Financial Research, 5(1),* 81-92.

Kanas, A. (2000). Volatility spillovers between stock returns and exchange rate changes: International evidence. *Journal of Business Finance and Accounting, 27(3-4),* 447-467.

Kasman, S., Vardar, G., & Tunç, G. (2011). The impact of interest rate and exchange rate volatility on banks' stock returns and volatility: Evidence from Turkey. *Economic Modelling, 28(3),* 1328-1334.

Khoo, A. (1994). Estimation of foreign exchange exposure: An application to mining companies in Australia. *Journal of International Money and Finance, 13*(3), 342-363.

Kontonikas, A. (2004). Inflation and inflation uncertainty in the United Kingdom: Evidence from GARCH modelling. *Economic Modelling, 21*(3), 525-543.

Kumari, J., & Mahakud, J. (2015). Relationship between conditional volatility of domestic macroeconomic factors and conditional stock market volatility: Some further evidence from India. *Asia-Pacific Financial Markets*, *22*(1), 87-111.

Kwan, S. H. (1991). Re-examination of interest rate sensitivity of commercial bank stock returns using a random coefficient model. *Journal of Financial Services Research, 5(1),* 61-76.

Kwan, S. H. (2003). Impact of deposit rate deregulation in Hong Kong on the market value of commercial banks. *Journal of Banking andFinance*, *27(12),* 2231-2248.

Laichena, K. E., & Obwogi, T. N. (2015). Effects of macroeconomic variables on stock returns in the East African community stock exchange market. *International Journal of Education and Research, 3(10),* 305-320.

Law, S. H., & Ibrahim, M. H. (2014). The response of sectoral returns to macroeconomic shocks in the Malaysian stock market. *Malaysian Journal of Economic Studies*, *51(2),* 183-199.

Lawal, A. I., Nwanji, T. I., Asaleye, A., & Ahmed, V. (2016). Economic growth, financial development and trade openness in Nigeria: An application of the ARDL bound testing approach. *Cogent Economics & Finance, 4*(1), 1-15.

Leeper, E. M. (1991). Equilibria under 'active'and 'passive'monetary and fiscal policies. *Journal of Monetary Economics*, *27*(*1),* 129-147.

Liew, V. K. S. (2004). Which lag length selection criteria should we employ? *Economics Bulletin, 3*(33), 1-9.

Lintner, J. (1965). Security prices, risk, and maximal gains from diversification. *The Journal of Finance*, *20*(4), 587-615.

Lizardo, R. A., & Mollick, A. V. (2010). Oil price fluctuations and US dollar exchange rates. *Energy Economics*, *32*(2), 399-408.

Maku, O. E., & Atanda, A. A. (2010). Determinants of stock market performance in Nigeria: Long-run analysis. *Journal of Management and Organizational Behaviour, 1(*3), 1-16.

Malaolu, V., Ogbuabor, J. E., & Orji, A. (2013). Determinants of stock price movements in Nigeria: Evidence from monetary variables. *Journal of Economics and Sustainable Development, 4*(14), 61-66.

Marashdeh, H. (2005). Stock market integration in the MENA region: An application of the ARDL bounds testing approach. Working Paper No 5-27. Wollongong, Australia: Department of Economics, University of Wollongong.

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance*, *7*(1), 77-91.

McKenzie, M. D. (1999). The impact of exchange rate volatility on international trade flows. *Journal of Economic Surveys, 13*(1), 71-106.

Mendoza, E. G. (1995). The terms of trade, the real exchange rate, and economic fluctuations. *International Economic Review*, *36*(*1*), 101-137.

Meng, X., & Deng, X. (2015). Interest rate and foreign exchange sensitivity of bank stock returns: Evidence from China. *Multinational Finance Journal,17(1 & 2*), 77–106.

Mirchandani, A. (2012). Analysis of macroeconomic determinants of exchange rate volatility in India. *International Journal of Economics and Financial Issues*, 3(1), 172-179.

Mlambo, C., Maredza, A., & Sibanda, K. (2013). Effects of exchange rate volatility on the stock market: A case study of South Africa. *Mediterranean Journal of Social Sciences, 4(14),* 561-570.

Mossin, J. (1966). Equilibrium in a capital asset market. *Econometrica: Journal of the Econometric Society*, 34*(4)*, 768-783.

Moya-Martínez, P., Ferrer-Lapena, R., & Escribano-Sotos, F. (2015). Interest rate changes and stock returns in Spain: A wavelet analysis. *Business Research Quarterly*, *18(2)*, 95-110.

Muhammad, N., Rasheed, A., & Husain, F. (2002). Stock prices and exchange rates: Are they related? Evidence from South Asian countries. *The Pakistan Development Review*,*41(4)*, 535-550.

Muktadir-al-Mukit, D. (2013). Effects of interest rate and exchange rate on volatility of market index at Dhaka stock exchange. *Journal of Business and Technology*, *7(2)*, 1-18.

Narayan, P. K. (2005). The relationship between saving and investment for Japan. *Japan and the World Economy*, *17*(3), 293-309.

Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. *Econometrica: Journal of the Econometric Society*, 59*(2)*, 347-370.

Nelson, C. R., & Plosser, C. R. (1982). Trends and random walks in macroeconmic time series: Some evidence and implications. *Journal of Monetary Economics*, *10*(2), 139-162.

Nkoro, E., & Uko, A. K. (2013). A generalized autoregressive conditional heteroskedasticity model of the impact of macroeconomic factors on stock returns: Empirical evidence from the Nigerian stock market. *International Journal of Financial Research*, 4(4), 38-51.

Nkoro, E., & Uko, A. K. (2016). Autoregressive Distributed Lag (ARDL) cointegration technique: Application and interpretation. *Journal of Statistical and Econometric Methods*, *5*(4), 63-91.

Nkoro, E., & Uko, A. K. (2016). Exchange Rate and Inflation Volatility and Stock Prices Volatility: Evidence from Nigeria, 1986-2012. *Journal of Applied Finance and Banking*, *6*(6), 57-70.

Nurazi, R., & Usman, B. (2016). Bank stock returns in responding the contribution of fundamental and macroeconomic effects. *Journal of Economic Policy*. 9(1), 129-144.

Obadan, M. I. (2010). Exchange rate regime for developing and emerging markets. In *International Conference for Central Banking, Financial Stability and Growth* (pp.1-21). Lagos, Nigeria.

Obstfeld, M., & Rogoff, K. (1995). The mirage of fixed exchange rates. *Journal of Economic Perspectives*, 9(4), 73-96.

Okoli, M. N. (2012). Verifying the effects of risk variables on return volatility of sector price indices in the Nigeria Stock Exchange. *Asian Economic and Financial Review*, 2(2), 400-406.

Okpara, G. C. (2010). Monetary policy and stock market returns: Evidence from Nigeria. *Journal of Economics, 1*(1), 13-21.

Olugbenga, A. A. (2012). Exchange rate volatility and stock market behaviour: The Nigerian experience. *European Journal of Business and Management*, *4*(5), 31-39.

Oluseyi, A. S. (2015). An empirical investigation of the relationship between stock market prices volatility and macroeconomic variables' volatility in Nigeria. *European Journal of Academic Essays*, *2*(11), 1-12.

Omorokunwa, O. G., & Ikponmwosa, N. (2014). Macroeconomic variables and stock price volatility in Nigeria. *Annals of the University of Petroşani. Economics*, *14*(1), 259-268.

Omotunde, R. A., & Nwokoma, N. I. (2016). Interest Rate Shocks And Stock Market Volatility In Nigeria (1985-2014). *West African Journal of Monetary and Economic Integration*, *16*(2), 44-72.

Onoh, J. O., &Obioma, J. (2017). A comparative study of monetary and Keynesian theories on inflation and money supply in Nigeria. *International Journal of Economics and Financial Management,2(1*), 56-70.

Ooi, A. Y., Wafa, S. A. W. S. K., Lajuni, N., & Ghazali, M. F. (2009). Causality between exchange rates and stock prices: Evidence from Malaysia and Thailand. *International Journal of Business and Management*, *4*(3), 86-98.

Osamwonyi, I. O., & Evbayiro-Osagie, E. I. (2012). The relationship between macroeconomic variables and stock market index in Nigeria. *Journal of Economics*, 3(1), 55-63.

Oseni, I. O., & Nwosa, P. I. (2011). Stock market volatility and macroeconomic variables volatility in Nigeria: An exponential GARCH approach. *Journal of Economics and Sustainable Development*, *2*(10), 28-42.

Osisanwo, B. G., & Atanda, A. A. (2012). Determinants of stock market returns in Nigeria: A time series analysis. *African Journal of Scientific Research*, *9*(1), 477-496.

Ouma, W. N., & Muriu, P. (2014). The impact of macroeconomic variables on stock market returns in Kenya. *International Journal of Business and Commerce*, 3(*11*), 1-31.

Oyinlola, M. A., Adeniyi, O., & Omisakin, O. (2012). The dynamics of stock prices and exchange rates: Evidence from Nigeria. *West African Journal of Monetary and Economic Integration, 12*(1), 67-92.

Parsva, P., & Lean, H. H. (2011). The analysis of relationship between stock prices and exchange rates: Evidence from six Middle Eastern financial markets. *International Research Journal of Finance and Economics, 66*, 157-171.

Pesaran, M. H., & Shin, Y. (1998). An autoregressive distributed-lag modelling approach to cointegration analysis. *Econometric Society Monographs, 31*, 371-413.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.

Priti, V. (2016). The impact of exchange rates and interest rates on bank stock returns: Evidence from US Banks. *Studies in Business and Economics*, *11*(1), 124-139.

Quadir, M. M. (2012). The effect of macroeconomic variables on stock returns on Dhaka stock exchange. *International Journal of Economics and Financial Issues*, 2(4), 480-487.

Ridderstaat, J., & Croes, R. (2017). The link between money supply and tourism demand cycles: A case study of two Caribbean destinations. *Journal of Travel Research*, *56*(2), 187-205.

Roll, R., & Ross, S. A. (1980). An empirical investigation of the arbitrage pricing theory. *The Journal of Finance*, *35*(5), 1073-1103.

Ross, S. A. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory,13*, 341-360.

Ryan, S. K., & Worthington, A. C. (2004). Market, interest rate and foreign exchange rate risk in Australian banking: A GARCH-M approach. *International Journal of Applied Business and Economic Research*, *2(2)*, 81-103.

Sévi, B., & Baena, C. (2011). Brownian motion vs. pure-jump processes for individual stocks. *Economics Bulletin*, *31(4)*, 3138-3152.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, *19*(3), 425-442.

Shiller, R. J. (1981). The use of volatility measures in assessing market efficiency. *The Journal of Finance*, *36(2)*, 291-304.

Sohail, N., & Hussain, Z. (2009). Long-run and short-run relationship between macroeconomic variables and stock prices in Pakistan: The case of Lahore Stock Exchange. *Pakistan Economic and Social Review*, *47(2)*, 183-198.

Soyibo, A., & Adekanye, F. (1992). *Nigerian banking system in the context of policies of financial regulation and deregulation*. Nairobi, Kenya: AERC.

Stevenson, S. (2015). The sensitivity of European bank stocks to German interest rates changes. *Multinational Finance Journal*, *6(3)*, 223-249.

Tabellini, G. (1987). Secrecy of monetary policy and the variability of interest rates. *Journal of Money, Credit and Banking*, *19(4)*, 425-436.

Tauchen, G. (2011). Stochastic volatility in general equilibrium. *The Quarterly Journal of Finance*, *1(04)*, 707-731.

Taylor, J. B. (2001). The role of the exchange rate in monetary-policy rules. *American Economic Review*, *91(2)*, 263-267.

Toraman, C., & Başarir, Ç. (2014). The long run relationship between stock market capitalization rate and interest rate: Co-integration approach. *Procedia-Social and Behavioral Sciences, 143,* 1070-1073.

Tran, H. T. (2013). Relationship between interest rate and bank common stock return: Evidence from the top 10 United States banks and financial sector index. A Senior Capstone Project research paper.

Tripathi, V., & Ghosh, R. (2012). Interest rate sensitivity of banking stock returns in India. *International Journal of Financial Management, 2(4),* 10-20.

Türkyılmaz, S., & Balıbey, M. (2014). The relationships among interest rate, exchange rate and stock price: A BEKK-MGARCH approach. *International Journal of Economics, Finance and Management Sciences, 1(3),* 166-174.

Umoru, D., & Asekome, M. O. (2013). Stock prices and exchange rate variability in Nigeria econometric analysis of the evidence. *European Scientific Journal, ESJ, 9*(25), 261-285.

Vee, D. C., Gonpot, P. N., &Sookia, N. (2011). Forecasting volatility of USD/MUR exchange rate using a GARCH (1, 1) model with GED and Student's-t errors. *University of Mauritius Research Journal, 17*(1), 1-14.

Verma, P., & Jackson, D. O. (2008). Interest rate and bank stock returns asymmetry: Evidence from US banks. *Journal of Economics and Finance, 32(2),* 105-118.

Watson, M. (1999). Explaining the increased variability in long-term interest rates. *Federal Reserve Bank of Richmond Economic Quarterly,85(4),* 71-96.

Xiao, X., & Zhou, C. (2018). The decomposition of jump risks in individual stock returns. *Journal of Empirical Finance, 47,* 207-228.

Yang, S. Y., & Doong, S. C. (2004). Price and volatility spillovers between stock prices and exchange rates: Empirical evidence from the G-7 countries. *International Journal of Business and Economics*, *3(2)*, 139-153.

Zhao, H. (2010). Dynamic relationship between exchange rate and stock price: Evidence from China. *Research in International Business and Finance*, *24(2)*, 103-112.

Zubair, A. (2013). Causal relationship between stock market index and exchange rate: Evidence from Nigeria. *CBN Journal of Applied Statistics*, *4(2)*, 87-110.